NEW-YORK FARMER,

AND

AMERICAN GARDENER'S MAGAZINE.

VOL. IX.] PUBLISHED MONTHLY, AT NO. 132 NASSAU STREET, NEW-YORK, AT THREE DOLLARS A-YEAR, IN ADVANCE. [No. 10.

D. K. MINOR, and GEO. C. SCHAEFFER, } EDITORS AND PROPRIETORS.

FOR OCTOBER, 1836.

NEW SERIES—VOL. IV.

STATE HISTORICAL SOCIETY
816 STATE STREET
MADISON, WISCONSIN 53706

☞ *This number of the New-York Farmer consists of two sheets—the postage therefore is three cents for any distance under, and five for any distance over, one hundred miles.*

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FOR OCTOBER, 183. NEW SERIES—VOL IV.

NEW-YORK FARMER.

OCTOBER 1, 1836.

COMPLETE PRACTICAL FARMER.

We have given this work a careful examination and are able to speak favorably of its execution.

The work is systematically arranged, giving great facility to reference—a very great advantage in an agricultural book.

The old prejudice against "book farming" is rapidly disappearing, and the good effects of this change are already to be seen.

We most earnestly recommend it to every farmer—if he learns nothing new (and he must be a most learned man to be in such a predicament,) he finds all he does know conveniently arranged for comparison and reference.

OSAGE ORANGE.

We insert the following paragraph from a Connecticut paper to show how the most absurd statements find their way into print, and are copied from one paper to another, until they have gone the rounds in the United States and Canada, and finally to complete the grand tour, cross the Atlantic.

We cannot perceive by what process of reasoning the learned author makes the Osage Orange to be the black walnut, and would most respectfully suggest that the next time he cracks jokes upon subjects entirely out of his circle of knowledge, and most likely beyond his power of comprehension, that he be particularly careful to not turn the laugh against himself.

The Osage Orange—*Maclura Aurantiaca* is a well known South-western tree, and in another column will be found an article on it as a substitute for the mulberry in feeding silk worms.

"OSAGE ORANGE.—Some of the *savans* of the age, who probably never saw much beyond a dandelion or a daffy-down-dilly, have discovered a wonderful tree in the far West, called the *Osage Orange*. In Connecticut we call it *black walnut*. We did indeed see a barber's boy sell some of the fruit once for *Muscovy* oranges, but the *Osage* is a new name. The boy being the first discoverer, or inventor, might have his action for damages."

Many of our native plants of exceedingly great beauty are passed over by cultivators, for more costly but also less beautiful exotics.

Among the plants of this sort in flower at this season, the Lobelia stands pre-eminent. The cardinalis and L-syphilitica are the most splendid; the scarlet flowers of the one and the blue of the other forming an elegant contrast.

We saw the other day a rose colored variety of the L-syphilitica, found within the vicinity of the city.

The attention of amateurs and cultivators is directed to this variety—could it be transferred to our gardens it would richly repay the slight trouble it might cost.

BULL OSSIAN.—Thorough bred Durham Bull, coming 5 years old and perfectly gentle, the present owner having gotten into his stock, has no further need of his services. He is therefore offered for sale, and at a price much below his value, and what he is worth to make into Beef. Apply soon to D. I. ANDERSON, Lodi, a little above the Patterson Railroad to Hackensack.

For the New-York Farmer.

We'll feel pleased in giving to the public the following communication, as we are persuaded that it may be much the means of introducing a most excellent breed into this country. In a recent paper, we find a yield of 8 pounds and a half, held up as beyond reach here or elsewhere. We hope the following *pill* will operate favorably.

We should feel happy in giving any information on this subject, Mr. Goold having offered to forward any orders for these sheep.

WHITCHURCH FARM, HANTS, (England,) May, 1836.

TO SHEEP BREEDERS—A PILL FOR PREJUDICE.

One hundred half-bred Cotswold and Down Tegs, bred by myself and brother, and fed by Mr. Cannon, Maidenhead, Berks, shorn on the 16th March last, then *thirteen and a half months old*, produced, on an average, *nine pounds* of wool each. Ten were immediately sold at 65*s.*; ten at 62*s.*, and the last twenty *culls* of the hundred, at 55*s.* each, *out of their wool*, for which 2*s.* per lb. has been refused. Calculating the wool at this price, the 100 Tegs have produced £400, or £4 per head. I seek in vain for a parallel in the *present*, or a record of a similar price in any *past age*,—PEEL'S BILL, or 12*s.* 6*d.* *notes*, turned into 20*s.* *gold pieces*, notwithstanding. The *eight* half-bred Tegs I exhibited at *Romsey*, produced *eighty and quarter pounds* of wool—over *ten pounds each*. The two year old *Ram*, (half bred,) *fifteen and a quarter pounds*, clean and well washed, all of which may be seen.

On 770 acres of Arable and Meadow land, we keep 620 breeding ewes, and 220 Tegs, being 70 over a sheep to an acre, always at fold, and *always at home*. Can our crack *down breeders* declare to the latter point, with a like number in proportion to acres? Five years impartial trial of *this cross* emboldens me to declare myself OPEN TO THE WORLD, to match it against *any other breed*, taking as the criterion of merit, the combination of those rare, but grand desiderata, WEIGHT and VALUE of fleece, symmetry of carcase, QUALITY of mutton, *capacity of folding*, with aptitude to fatten, and arrive at early maturity.

I am yours, &c.,
JOHN TALMADGE TROYNAM.

To the Editor of the New-York Farmer:

SIR—Should you deem the above worthy a place in your valuable Journal, I shall be happy to forward you any further communication I may receive from the same source. I have written to Mr. Troynam, (who is my brother-in-law,) to forward me twenty of these sheep for a friend in Pennsylvania; and should any of your friends be desirous of obtaining any of this breed, I shall be happy to be the medium of communication to Mr. T. on the subject.

Mr. T., in a letter, remarks that these sheep are a *new breed*, of his own fancy, and have been produced by crossing the *Hampshire Down* with the *New Leicester*, and whose *equal* he has *two* successive seasons challenged the *world* to produce.

M. GOOLD,
Premium Pickle Establishment, office No. 58 Broadway.
New-York, September, 1836.

FRAGMENTS OF MY MEMORANDUM BOOK.

[The following article is formed of parts of the memoranda which the writer was formerly in the habit of hastily noting down, whenever his very limited opportunities for agricultural observation occurred, and which observations were generally directed to particular localities more by the compulsion of other circumstances, than by the mere object of seeking such facts and information as were found. The record was commenced and kept (in a loose and irregular manner,) solely for the writer's amusement, and first designed to meet the eye of no other person—and the length of time that has since elapsed will suffice to prove that publications of these parts was not then de-

signed. Upon looking over them recently, they appeared to contain nothing that ought to give offence to the individual referred to, and the views, and even the mistakes of the writer, may attract the notice of others to points deserving more full and correct statements. Several of the more important parts of the notes were before published in the 1st and 2nd vols. of this journal, under the signature of "A Gleaner"—and if these remaining fragments are of no other use, they may suggest to readers who have better opportunities to travel, and to converse with farmers, how easy it would be for them to note down more important information, and to furnish to the Farmers' Register communications that would be far more interesting and valuable.]

Charles City, November 27th, 1836.

* * * * * None of the farmers, yet met with, use green clover in any way as food for working horses—and all consider its use would be extremely injurious to them. This certainly agrees with the opinions of my overseers, who have never permitted me to adhere long to even the partial use of green clover, though mown 24 hours before being used. They would insist that it weakened the horses, though their corn was not diminished, and they still had dry fodder once a day. I attributed their opposition to prejudice and ignorance: but here I find very intelligent and experienced farmers all concurring in the same opinion. Yet it is certain, as we see in English agricultural works, that green clover (aided by tares perhaps for a short time) is the long food of work horses as long as the mowing season lasts; and also that the amount of grain given is diminished considerably while clover is eaten. Can climate cause this great difference in practice? Or is our's altogether founded on mistake?

Mr. W——— T——— regularly harrows his corn field flush (with a straight toothed square harrow, such as would cover seed wheat most effectually,) when the corn plants are high enough to want the first weeding (say 6 inches.) He finds no damage caused to the corn, and its tillage and cleaning much aided by the operation.

On the 28th, proceeded to Curles' Neck, (Henrico,) a peninsula of very uniform soil and character, bounded by James River, and two creeks, on three sides. It consists of several thousand acres of arable land, and is in seven or eight separate farms, formerly held by as many distinct proprietors. But, unfortunately for the improvement and value of the land, and for the public interests, five of these farms have been drawn into the gulf of a single rich man's estate. A perfect land-killing business now must be expected to follow—which was bad enough during the owner's life—but will be now worse, as the whole property (except its profits for a certain time,) is bequeathed to an infant, and for nearly 20 years this and all the other lands of this large estate must be butchered at the discretion of overseers.* The comfortable and handsome mansions are already going to destruction; and it would be useless to attempt to save them by repairs, as the owner can more cheaply suffer useless buildings to rot, than to preserve them. Our country presents every where the ruinous consequences of the division of farms, and the destruction of their value by being cut up into several pieces, no one of which is fit to live on: but here is equal destruction of value, in prospect, from the reverse operation—the accumulation of a number of fine farms in the possession of a single owner.

The soil of the whole peninsula, (or *neck*, which is our provincial name for such situations,) with some exceptions, is a mellow brown loam—a rich neutral soil, deep enough for ploughing of any power. It has generally, (since good farming was commenced here) been ploughed as deep as the team could effect, say 7, 8 or 9 inches—and the soil would permit still more. No doubt the original fertility of the soil was very great—but a long continued course of the common close cropping and grazing, and shallow ploughing, had reduced the soil to a low product, and mean appearance.—Some enterprising proprietors began deep ploughing, and tried gypsum on clover; and found such remarkable benefit from all, that the land was rapidly and profitably improved. Now, though brought by bad management below its best state, this body of land is certainly the best that I have seen below the mountains, and of highland: and in situation and soil, may be considered as among the most valuable lands in the State. Yet the average sales of the several tracts last bought were not much higher than $20 the acre. I should suppose it well worth $40.

The rotation generally adopted here is as follows:

1. Wheat on clover lay, ploughed deep when broken, and again shallow before sowing.
2. Corn, for which the previous winter's manure is all used.
3. Wheat, on which clover is sowed.
4. Clover, not mowed, and but little grazed, and ploughed in August for the next crop of wheat.

This rotation agrees in general with that of Shirley, except the substitution here of corn for oats. Theory seem to approve the different mode of applying the manure, which is heaped and fermented as much as time allows, and carried out for the corn crop—thus having its benefit earlier than at Shirley, by one crop in the rotation. But I was told by Mr. M——— S———, (to whom I am indebted for most of the information obtained here,) that they would prefer keeping the manure for the wheat, but for the impossibility of providing labor to apply it during that very busy season. Very few cattle are kept, so that vegetable manure passed through the stables and barnyards, or ploughed in on the fields producing it, forms nearly the whole means of sustaining and improving the land under this apparently scourging rotation. Gypsum aids the growth of clover in a remarkable manner, and has been heretofore used generally, and perhaps every field has at some time had its aid. But here and elsewhere in lower Virginia, this manure is more rarely used now than formerly, which seems to make it doubtful whether the profit always more than repays the expense.

No lime has been used at Curles' Neck A small experiment made with shell marl had good effects, as I was told; but I did not see the land, or the marl. This manure is found in the neighborhood, at Malvern Hills. The best land, forming the greater part of Curles', is certainly a neutral soil, and could derive no benefit from the neutralizing power of calcareous manures, which is their most valuable effect on worse soils: but no doubt the other properties of those manures would prove highly beneficial here, and on every other soil not already calcareous.

Twice ploughing the clover lay, produces a better crop of wheat than once. This is also Mr. C———'s opinion; but he thinks the single ploughing which he adheres to, has more than compensating advantages in better securing the fertilizing power of the clover turned in. Certainly, sound theory seems to support this opinion; and the authority of Arthur Young, and the practice of good farmers in England, had taught me to expect from the single ploughing, a better succeeding crop, as well as more fertilization. Young denounces ploughing clover lays more than once, on any soil clean and light enough to prepare for wheat in that manner.

A singular practice has prevailed here to some extent. From so few cattle being kept, there is always a large surplus of coarse food and litter, the only use of which is to be converted to manure: and to aid this object, the farmers here often receive cattle from the neighboring poor lands, and support them free of charge through the winter. As a matter of mere economy, I doubt the propriety of this practice—as the food consumed by a cow would have been worth more as manure, than the excrement left from it, after supporting the animal with its nutritious parts.

Heard of no lime having been used as manure, between Shirley and Richmond, and only one small experiment with marl, at Curles'. I did not see the spot, nor the stratum from which the manure was taken. Saw a fine body of marl, (which I think is gypseous from appearances,) at Evelynton, on the border of Herring Creek, in Charles City. No use has been, or will be made of it by the owner, who however is zealously engaged in hunting for and digging gold ore, in Spottsylvania. He will be a lucky miner if he derives as much profit from his gold, as he loses by neglecting the marl at his place of residence.

* * * * * * *

YORK COUNTY.—The farm called Kings' Creek, on York river, and on the creek of the same name, is the finest and most beautiful body of land in this part of the country, under the most execrable management. It is, 800 acres: some back land high and poor—but the greater part, on and near the river, is a level sandy loam; deep, rich and neutral soil—part nearest the river bank highly calcareous, from the quantity of oyster shells which have been on the surface before the settlement of the country. We had no means of obtaining any accurate information as to products—and the miserable cultivation of the fields, and the close grazing, forbade our seeing the full worth of the land. This estate sold a few years ago, for $40,000, in 8 yearly payments, without interest. It then had a splendid dwelling home, which has since been burnt. * * I should *guess* that this land, (excluding the poorer half,) would now make 25 bushels of corn, and 12 or 15 of wheat—and much more if put under a proper rotation, and decent management. It was supposed that if now sold, this place

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*In this supposition the writer was mistaken. Curles' Neck has continued under the general charge of the gentleman who had temporarily assumed it just before the time of the above notes, and who is one of the joint owners of the income of the whole estate for a limited time, that has not yet expired: and to his sound knowledge, and skilful management as a farmer, is due the then unlooked-for result, that the downward course of the system of management has not only been stayed, for a time, but the previous good culture and improvement of soil restored as much as existing circumstances permitted.

would command $25,000. At even $30,000 I should consider this estate very cheap, if it was not in the oyster country: but *there*, where every advantage of good and cheap living is found—good navigation and choice of markets—rich soils, or the best manures for improving poor ones—a curse seem to fall in every body, and scarcely a profitable farm, or thriving farmer, can be heard of.

Belfield, below, is another excellent farm, though inferior greatly to the last. This has 1000 acres, a dwelling house and farm houses of sufficient extent, and middling value, and sold for $8,000. The quality and appearance of the land very like King's Creek, though of less value and fertility.—Here there is abundance of rich marl, which is used to very good purpose, though not very extensively as yet. The owner is Mr. R——— M———, a lawyer who resides in Williamsburg, and gives up the management of his land almost entirely to his overseer. Fortunately he has a good one, (from Charles City,) and this farm seemed to me the most profitable for the investment, not only in present returns, but in the system of improvement, and future prospects, of all that I viewed or heard of.

Porto Bello, the land of Mr. B———, and the two last mentioned estates, lie on the best waters of York river for obtaining the finest oysters. Vessels are always waiting (during the season, from September to May) for loads, to be carried to the north, and a number of boats are engaged every day in catching oysters for their supply. The great quantity opened for the inland market, on the adjacent landings, furnish lime that is now used largely to improve the lands; and the "oyster crackings" make a still better manure, which had accumulated in large quantity, but has latterly been all used. The crackings are the thin parts of the oyster shells, which are broken in opening them, and are small enough to be used without burning, and thus retain all the animal matter which fire destroys. Lime is also used by Mr. B———, and others between Porto Bello and Williamsburg—and to as much advantage as can be expected on the three-shifts and grazing rotation. Saw marl on Mr. B.'s land so easy to apply, that it would be cheaper than burning lime, though the shells were already in heaps on the field. The marl certainly was poor and sandy, and therefore he had thought it not worth using; but it was so accessible, and well situated, that after once opening a pit properly, a mule could marl the first 30 acres in as many days. 100 to 120 bushels of slaked lime is considered here (as also among the good farmers on James River) a full dressing, for safety: but though that opinion is doubtless correct, as to *caustic lime*, still that quantity cannot give half the calcareous matter the soil usually requires, and that 400 bushels of good marl would give. The lime will therefore need renewal—and in comparing the cost of using marl and lime, perhaps the cost of the latter ought to be doubled, to be fairly opposed to marling.

Heard that R———, in Gloucester, the seat of the late G——— P———, is now offered for sale for $7,000. It has 700 acres of very good land, and a building which has been the most costly, as well as largest private mansion in Virginia, but is now so much out of repair, that it would be cheaper to pull it down and build another house out of the materials.

* * * * * * *

In Williamsburg, which is half town, half country, much putrescent manure is collected from the streets, principally the pure dung of animals, for the use of the surrounding farms. This is generally "preserved" as it is supposed, or, as I consider, subjected to the greatest possible waste, by being heaped alone, and exposed to rain and sun, until wanted. Under these circumstances, decomposition, and the evolving of the gaseous products, must proceed continually and rapidly. The excrement from the Lunatic Hospital has for half a century been thrown into large pits, and never has been removed, except into the air by decomposition, and only was covered deep by earth, when the pits became a nuisance. If the rich marl, which is on the spot, were used to mix regularly with these excrementitious matters, they would never become offensive, and would be preserved as a body of the richest manure. If I lived near, I would give an annual rent of $50 for the use of this manure, which nobody will now meddle with.

* * * * * * *

Dr. M——— of Weyanoke has continued for 5 or 6, or perhaps more years to cultivate the same field in corn.—but with peas planted between the rows of corn. Last year, about 250 bbls. from this field or (as his overseer thought) about one third of the whole, was found rotten when gathered.—There seemed to be sufficient reason to believe that this was caused by corn being so long continued on the same ground. But I have heard of a much longer uninterrupted succession of corn, on either very rich land, or where there was the worst and laziest farming—and no such evil was attributed to the plan. Indeed, I had thought that corn, different from all other grain, might be cultivated forever on the same land without diminution of product, provided the land was kept as rich as at first.

* * * * * * *

When passing through the light ridge land of James City, Mr. ——— pointed out a field which had been ploughed a number of years ago, in August, "as deep as two horses could break the land," and that so much injury had been sustained, that the field had never recovered. The soil was like the neighborhood in general, a poor silicious sand, on a similar white sub-soil, and not marled.

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From the American Gardner's Magazine.

SOME REMARKS ON THE TREE PÆONY (PÆONIA MOUTAN,) INCLUDING ITS HISTORY, INTRODUCTION INTO ENGLAND, THE PRODUCTION OF NEW SEEDLING VARIETIES, PROPAGATION, CULTIVATION, &c. BY THE CONDUCTORS.

The tree pæony, and its varieties, *Pæonia, Moutan*, of botanists, are among the most splendid plants of which our gardens can boast. They have long been cultivated in England, and have there become quite common—so much so, that there are, probably, but few gardens that lay any pretensions to beauty, which are not adorned by the gorgeous blossoms of this fine tribe. In this country they are yet unknown to country gardens, and, perhaps, with the exception of the amateur and nursery collections in and about our principal cities, few if any plants are to found. The comparatively high prices which they have commanded, and still command, may be, perhaps, one cause why they are less often seen; but we apprehend a better reason is, that they are almost unknown.

The common double red pæony,—the ornament of almost every garden,—the treasured flower of the humble cottage—expanding its gay blossoms when but few other plants are in flower,—is too well known to need any description. When this was first introduced to England, it commanded an equally high price with that of the tree pæony at the present time, nor was it probably less admired; and although numerous varieties of it have been produced, there are but four or five that rival, and we may almost say, none that surpass it, in splendor. As common as this is, the idea of a *tree* pæony is quite novel; and there are but few persons who have seen one in bloom, who were not greatly surpirsed to hear of such a plant. To see the latter grown side by side with the former, is part of the object of this paper; for though at present quite rare, we hope to see the time when every garden will be enriched by its truly magnificent blossoms.

Long before the plants were introduced into England, they were well known from the botanical and other works upon China and Japan, as also from the repeated representations on Chinese porcelain and paper hangings, and in their paintings, &c.—Many varieties are said to exist in China, which have not yet been introduced to England, and the London Horticultural Society possess several paintings of kinds different from those at present to be found in gardens. The Chinese are so selfish in regard to all the plants they possess, that, whatever price is offered, they are reluctant to sell them, and oftentimes deceive purchasers, by selling the most common kinds for those quite rare; and this, too, when the rare ones, to us, are as abundant in their gardens as the more common. So often have purchasers been deceived in this manner, that, from the hundreds of plants that have been imported into England, as yet, according to most writers, only five or six are, in reality, dissimilar. Mr. Sabine, however, in the *Horticultural Transactions*, enumerates seven; and in the *Hortus Britannicus*, eleven Chinese varieties are registered.

Perhaps it may not be uninteresting to notice some of the names and colors of the varieties which are said still to exist in the Chinese gardens. That there are a great number we have no reason to doubt. The Chinese are great lovers of beautiful plants, and, although they do not possess a knowledge of vegetable physiology, sufficient to enable them to procure new kinds with any certainty, yet they spare no exertions to do so as far as their knowledge extends, as we may infer from the number of kinds of camellias and other plants which have been introduced. Various travellers have made great statements in regard to the varieties of pæonies they possess; too great reliance is, however, not to be placed upon them, for perhaps they have been deceived. The only good evidence of any such existing is to be derived from the drawings which have been made by good artists, and who have colored them accurately from actually growing plants. Of such, five were executed at Canton, in 1806, for the library of the East India Company, and copies of them have

been made for the London Horticultural Society. Two of them are referable to the *P. papaveracea* Banksiæ and rosea. The third is called the *Tsu Moutan*, the first name indicative of the color, and has fine purple blossoms. The fourth is the *Pae Moutan*, with double white flowers. The latter is of slender growth; it is very scarce and highly esteemed. Mr. Sabine, in a paper in the *Horticultural Transactions*, to which we are indebted for the information in regard to the history of the tree pæony, states, that one of the double purple *Moutans* was purchased (about the year 1820) by an American captain, in order to be carried home. But we have never heard of such a variety, and it was, in all probability, lost on the voyage. The fifth drawing is called the *Hong Moutan Fa*, and is said to be a yellow (?) flower. It is said to have been taken from a plant which flowered in the house of a mandarin at Canton, in February, 1810. This, however, was not believed when this statement was published, and the existence of a yellow variety is considered very doubtful. Stories are current at Canton, that they have them of all colors, even blue and black (?). Mr. Main, who went out to China in the year 1792, for Gilbert Slater, Esq., states, in a late paper, entitled "Reminiscences of a Voyage to and from China," in *Paxton's Horticultural Register*, that he selected a yellow with two other varieties, to bring out with him; but we find no further account of it.

The London Horticultural Society, under the direction of Capt. Reeves, had six drawings executed in China, which are to be depended on for their accuracy. Two are referable to the *papaveracea* and *p Banksiæ*. The third is a semi-double white of no great beauty: the fourth a double purple, similar to the one above named: the fifth a small purplish red, with pale edges to the petals: the sixth a very double pale red, with small inner petals. The society also possesses two other paintings, copied from Chinese originals in the collection of Lady Banks, which are supposed correct; one is a deep red, the other a white flower tinted with green. In a work entitled *Memoires sur les Chinois*, there are several pages devoted to the history, native habitats, and other particulars respecting these plants. From these, which Mr. Sabine partly embraces in this account, we learn that they are of great antiquity in gardens in the north of China, and supposed to have originally been found growing wild on the mountains in the province of Honan. They were subsequently cultivated in the imperial gardens of Kai-fong-fou, in Ho-nan; but they flourish better in the province of Hou-Kouang, from whence they are sent to Pekin, Canton, and other parts of the empire. Mr. Main, in the paper before alluded to, states that they are natives of, and much cultivated in, the province of Nankin. It is also represented that the Chinese have plants of various heights, from very dwarf ones to those of twenty or more feet high, and that they produce their flowers at different seasons; some in winter and others in autumn. This account is undoubtedly true, in regard to the native hardiness of the plants; as their habits would lead us to suppose that they were of Alpine origin, subject to being buried in deep snows during winter, and in spring breaking into foliage rapidly, and making strong short shoots in the early part of the season.—Some writers, among whom are Thunberg and Loureiro, referred all the pæonies which they saw to the *P.* officinalis.—From China they were introduced to Japan, where they are extensively cultivated.

The introduction of the plants to England, from China, is said to be attended with considerable difficulty; the length of the voyage being so great, that nearly all the plants die on the way. But we are inclined to think that the loss of the plant is more to be attributed to the state they are in, when sent from China, and the mode of packing, than from the length of the voyage. Mr. Main states that the plants are brought to Canton from the province of Nankin, and, when done flowering, for the most part thrown away. He also states, that he turned some out of the pots which had just arrived, and found them "most barbarously used." It appeared that they had been raised in the open ground, in a strong alluvial soil, and had all their strong thick woody roots *docked short off*, to fit a small pot, for the convenience of carriage. Undoubtedly most of the plants which are imported are in no better condition than these; and this is sufficient to ensure the death of almost any plant during a voyage of three or four months. The plants are, for the most part, thrown away by the Chinese when they have blossomed once, as it is not believed they will flower again. At the time they flower, the officers of the East India Company are absent at Macao, to which place they generally resort after the sailing of the ships, so that they have no opportunity to see the plants themselves when in bloom, but rely upon the native residents at Canton. This circumstance accounts for the uncertainty which exists in regard to the number of the varieties, and the dissimilarity in color of the flowers.

The best account of the *Pæonia Moutan* which has been published, was by the late Mr. George Anderson, in the *Transactions of the Linnæan Society*. In that paper, which forms part of a monograph of the tribe, written in the year 1817, he adopted the single-flowered plant as the type of the species, and the two others then known and described as species, he considered as only varieties. In this he was some time afterwards (1824) followed by DeCandolle, who adopted his order of the plants; and subsequent writers have concurred with this method. The specific name, *Moutan*, was first given by Dr. Sims, in 1808. It was called by one or two writers, *P.* arborea; but the former name is now established, and we only occasionally see the latter applied in catalogues or minor works on gardening.

M. Arago, on Wednesday, in delivering a lecture on the theory of the central heat of the earth, related an operation at this time carrying on in Paris, which may be of the highest importance not only to science but to public economy. The municipality have ordered an Artesian well to be pierced near the Barriere des Martyrs; but the men employed, after getting to a depth of 900 feet without finding water, came to a stratum of chalk, so thick that the undertaking would have been given up, but for the interference of men of science, who wished it to be continued with a view to the above theory. According to observations made by means of a thermometer, *a maxima*, no doubt remains as to a fact, which hitherto it has not been possible to verify with any degree of precision, namely, that the temperature of the earth rises in regular proportoin towards the centre; so that at the tenth degree from the surface, all known matter must be in a state of fusion. At the point to which the perforation in question has reached, M. Arago expects a spring of water will arise of a sufficient degree of heat to warm public establishments, supply baths, and serve for other purposes. We cannot help thinking this expectation of M. Arago a very fanciful one.

From the American Gardner's Magazine.

ON THE CULTIVATION AND PROPAGATION OF THE PINK (DIANTHUS,) MORE PARTICULARLY THE CARNATION, PICOTEE, AND PINK.—BY S. WALKER.

"Jove's flower; and, if my skill is not beguiled,
He was Jove's flower when Jove was but a child."

Permit me, dear Sirs, through the pages of your valuable Magazine, to submit a few hints to your readers on the cultivation and propagation of some of the varities of this beautiful class of flowers, viz: the carnation, picotee and pink. The cultivation of these plants has occupied the attention, and called forth the labor and care, of some of the great and good in ages that have passed away. Would it be asking too much of the present generation, while "the schoolmaster is abroad," to turn aside a few moments, and admire nature in "her holiday suit and Sunday clothes?" I will take it for granted, it is not; indeed, I cannot but believe a love of flowers, and a taste for cultivating them, is rapidly increasing in every section of the country: if we look to the east or to the west, to the north or to the south, we see magazines and newspapers springing up, devoted to floriculture. Such being the case, I am induced to send you the present article, although I am aware I can add but very little, with advantage, to what others have already said on the cultivation of these plants, or bring any thing new before your readers; yet I shall endeavor to select and lay before them, in a condensed form, the directions and opinions of others, and a few general remarks of my own, on the successful cultivation of the pink, picotee and carnation.

THE CARNATION.—Modern florists value this plant highly, and distinguish itto in four classes. First, *flakes*, of two colors only; the ground white, with a large stripe of scarlet, crimson or other color, going quite through the petals. Second, *bizarres* (signifying odd, irregular;) with flowers striped or variegated with three or four different colors, with irregular stripes or spots.—

Third, *picotees, piquettes,* or *biquetees ;* edge fringed, usually having a white ground, with spots or small stripes of scarlet, red, purple, or other colors. To enumerate the varieties would be useless, says Green, as they are not permanent, and every country producing new flowers almost every year, which, though at first rising they may be greatly valued, in two or three years become so common as to be of little worth, especially if they prove defective of any one good property, and are turned out to make room for *new sorts.* I will therefore refer my readers to the lists of the florists and nurserymen, who import them or raise them from seed, who have a great variety under pompous names. The following are what the florists call the good properties of a carnation. The flower-stem should be strong, and able to support the weight of the flower in an erect position. The petals should be long, broad, and stiff, and easy to expand, or, as the florists term it, should make free flowers ; the outer circles of petals should turn off gracefully, in an horizontal direction, and should be sufficiently strong to support the inner petals, which should diminish in size as they approach the centre. The petals should lie over each other in such a manner, as that their beauties can meet the eye at once ; the middle of the flower should not advance too high above the other parts, and the edges should be entire, without fringe, notch, or indenture ; the color should be bright and equally marked all over the flower ; the flower, when blown, should be very full of petals, and the outside perfectly round ; the stem should not only be strong, but straight, not less than thirty, nor more than forty-five inches high ; the flower should not be less than three inches in diameter, and the petals well formed—neither so many as to appear crowded, nor so few as to appear thin ; the lower or outer circles of petals, commonly called the guard-leaves, should be substantial, and rise perpendicularly about half an inch above the calyx ; the calyx should be at least an inch in length, and sufficiently strong at the top to keep the bases of the petals in a close and circular body.

PROPAGATION AND CULTURE OF THE CARNATION.—Having obtained a quantity of good seeds, prepare a proportionable number of pots or boxes, filled with soil mixed with rotten cow-dung, &c., incorparated well together ; then sow the seed and cover them with about a quarter of an inch of the same compost, sifted finely ; place the pots or boxes in an airy part of the garden ; keep the soil moist, and shade them from the mid-day sun and heavy rains. The time for sowing the seed is about the first of May ; in about twenty days the plants will come up, and, if kept clear from weeds and duly watered, they will be fit for transplanting about the first of August, at which time prepare some beds of the same compost as they were sown in, in an open, airy situation ; plant them in rows, about ten inches apart in the row, and twelve inches from row to row ; during the winter, cover the plants with pine poughs, or any other light covering ;—by these means they will generally flower the following summer. When they begin to shoot up their stalks to flower, they ought to be supported by sticks ; and attentively looked after as soon as they begin to blow, to ascertain which of them promise to be good flowers ; pull up all single and ill colored flowers, to allow the others more air and room ; propagate the good ones by layers.

TO PROPAGATE BY LAYERS.—After you have made choice of such shoots as you intend to propagate, and have loosened the soil round the plant, and, if necessary, raised it with fresh soil, that it may be level with the shoot intended to be laid down, strip off the leaves from the lower part of the shoot, and cut off the top of the leaves ; make choice of a strong joint, the third or fourth from the crown of the shoot ; then with a sharp knife make a slip close below the joint, about three fouths through the shoot, from the joint upwards ; remove the swelling part of the joint where the slit is made, so that the part slit may be shaped like a tongue ; for if the outer skin be left on, it will prevent their pushing out roots ; then make a hole in the earth with your finger, just where the tongue in the shoot is to come ; put into the hole about a teaspoon full of silt, or fine sand from the river ; then with your finger and thumb gently bend the shoot into the earth, observing to keep the top as upright as possible, that the slit may be open ; and, having provided forked sticks for the purpose, thrust one of them in the ground so that the forked part may take hold of the layer, in order to keep it down in its proper place ; then cover the shank of the layer with soil, giving it a gentle watering, which should be repeated as often as it is necessary to promote their taking root. They will have taken root in about five or six weeks ; cut them off from the parent plant, leaving about an inch of the stalk below the incision attached, and plant them in pots or beds, or in the borders, as you intend to bloom them. The soil suitable for the carnation and pink is rich maiden loam, to which add one third part of well rotten cow-dung, and about one sixth part of drift sand from the side of the river, or other water courses ; to this add a small quantity of air-slacked lime, say a quart to a barrow full, and about double the quantity of wood ashes ; mix these well together several times in the autumn and spring, and use it the second season ; protect your compost with boards from the drenching rains and the mid-summer sun.

TO PROPAGETE BY PIPINGS.—The piping of the carnation is not attended with as much success as the piping of the pink.—Our warm weather, during the months of July and August, is much against this method of propagating the carnation ; even in England not more than one-half of the pipings that are put in ever take root ; and were it not that some of the best sorts make very little and very short shoots, and are also very brittle, and difficult to propagate by layers, I should recommend that the piping of carnations should be discontinued ; but, as the most difficult sorts to propagate are generally the most valuable, I will make a quotation from Paxton, which appears to me to contain the best information on this subject. Prepare a slight hot bed in an eastern aspect, and as soon as the heat is moderate, lay on about six inches thickness of light mould, sifted finely. No piping should have less than two or three complete joints.—Take off the cutting horizontally, just below the second or third joint, and merely cut off the leaves from the joint that is to be inserted into the soil, but leave the others entire, except the tops, which cut off square, a little above the centre of the crown of the shoot After giving the earth of the bed a moderate watering, place on a hand or bell glass to mark the boundaries in which the pipings are to be planted ; plant the pipings half an inch deep, and at least an inch and a half or two inches distant from each other. Many authors, and among the number Paxton, say, not more than an inch apart.—This I conceive to be an error, and one of the causes of failure in piping : by crowding too many pipings under the glass, they hold too much moisture, and damp off. After you have put in all your pipings, give them a gentle watering, to fix the soil closely about them ; let them remain uncovered until the leaves are dry ; then place on the glasses, and press them gently down to prevent the admission of air ; give the pipings a little morning sun, but always shade them when the heat becomes strong, which may be done by covering the glasses with mats. It is necessary, after the first week, that the glasses be occasionally taken off to admit air, but this must never be done when the sun is powerful, but rather in cloudy weather, or early in the morning. When the pipings are watered, never place the glasses over them until the leaves are dry, and then not without first drying the glasses, or mildew will be the consequence ; and this must be continued until the pipings are well rooted, which will be in about six weeks, when the glasses may be removed altogether. When there are any very choice varieties, I would recommend that they be piped with tumblers, and put only one piping under each glass. I have almost invariably succeeded in this manner, when the piping in mass has nearly, if not quite, a failure.

THE CULTIVATION AND PROPAGATION OF THE GARDEN PINK (Dianthus plumarius.)—The pink is more hardy than the carnation, and may be propagated with success, by dividing the roots in the spring ; but as these divisions never make such good plants, or bloom so fine as layers or pipings, it is a desideratum to raise new plants every year, either from layers or pipings, as one year old plants bloom very superior to those of any other age. When your pipings are prepared, make choice of a shady part of the garden ; let the soil be light and sandy ; put your pipings in after the same manner as recommended for the carnation, watering them with a fine rose watering-pot, until the soil is completely satured ; cover them with a hand glass, which should not be removed until they begin to grow ; after that they may be exposed in the morning and evening, until they are able to bear the open air. The usual time for piping the pink is July ; but I have succeeded much better when I have attempted it in September. Our dog-day weather is generally very much against the propagating of pinks by piping. The pink may be cultivated from seed in the same manner as the carnation, and in the same compost, with the addition of a little horse manure. Maddock gives the following as the *criterion of a fine pink :* "The stem should be strong and erect, and not less than twelve inches high ; the calyx smaller and shorter than the carnation, but nearly similar in proportion, as well as in the formation of the flower, which should not be less than two inches and a half in diameter. The petals should be large, broad and substantial, and very fine fringed or serrated edges, free from notches or indentures ; in short, they approach nearest to perfection when the fringe or edge is so fine as scarcely to be discernible ; but if they could be obtained entire, it would be desirable. The broadest part of the lamina, or broad end of the petals, should be perfectly white, and distinct from the eye, unless it be a laced pink, that is, one ornamented with a continuation of the color of the eye round it, bold, clear, and distinct, having a considerable proportion of white in the centre, perfectly free from tinge or spot. The eye should consist of a bright or dark rich

been made for the London Horticultural Society. Two of them are referable to the *P. papaveracea* Banksiæ and rosea. The third is called the *Tsu Moutan*, the first name indicative of the color, and has fine purple blossoms. The fourth is the *Pae Moutan*, with double white flowers. The latter is of slender growth; it is very scarce and highly esteemed. Mr. Sabine, in a paper in the *Horticultural Transactions*, to which we are indebted for the information in regard to the history of the tree pæony, states, that one of the double purple *Moutans* was purchased (about the year 1820) by an American captain, in order to be carried home. But we have never heard of such a variety, and it was, in all probability, lost on the voyage. The fifth drawing is called the *Hong Moutan Fa*, and is said to be a yellow (?) flower. It is said to have been taken from a plant which flowered in the house of a mandarin at Canton, in February, 1810. This, however, was not believed when this statement was published, and the existence of a yellow variety is considered very doubtful. Stories are current at Canton, that they have them of all colors, even blue and black (?). Mr. Main, who went out to China in the year 1792, for Gilbert Slater, Esq., states, in a late paper, entitled "Reminiscences of a Voyage to and from China," in *Paxton's Horticultural Register*, that he selected a yellow with two other varieties, to bring out with him; but we find no further account of it.

The London Horticultural Society, under the direction of Capt. Reeves, had six drawings executed in China, which are to be depended on for their accuracy. Two are referable to the *papaveracea* and *p* Banksiæ. The third is a semi-double white of no great beauty: the fourth a double purple, similar to the one above named: the fifth a small purplish red, with pale edges to the petals: the sixth a very double pale red, with small inner petals. The society also possesses two other paintings, copied from Chinese originals in the collection of Lady Banks, which are supposed correct; one is a deep red, the other a white flower tinted with green. In a work entitled *Memoires sur les Chinois*, there are several pages devoted to the history, native habitats, and other particulars respecting these plants. From these, which Mr. Sabine partly embraces in this account, we learn that they are of great antiquity in gardens in the north of China, and supposed to have originally been found growing wild on the mountains in the province of Honan. They were subsequently cultivated in the imperial gardens of Kai-fong-fou, in Ho-nan; but they flourish better in the province of Hou-Kouang, from whence they are sent to Pekin, Canton, and other parts of the empire. Mr. Main, in the paper before alluded to, states that they are natives of, and much cultivated in, the province of Nankin. It is also represented that the Chinese have plants of various heights, from very dwarf ones to those of twenty or more feet high, and that they produce their flowers at different seasons; some in winter and others in autumn. This account is undoubtedly true, in regard to the native hardiness of the plants; as their habits would lead us to suppose that they were of Alpine origin, subject to being buried in deep snows during winter, and in spring breaking into foliage rapidly, and making strong short shoots in the early part of the season.—Some writers, among whom are Thunberg and Loureiro, referred all the pæonies which they saw to the *P.* officinalis.—From China they were introduced to Japan, where they are extensively cultivated.

The introduction of the plants to England, from China, is said to be attended with considerable difficulty; the length of the voyage being so great, that nearly all the plants die on the way. But we are inclined to think that the loss of the plant is more to be attributed to the state they are in, when sent from China, and the mode of packing, than from the length of the voyage. Mr. Main states that the plants are brought to Canton from the province of Nankin, and, when done flowering, for the most part thrown away. He also states, that he turned some out of the pots which had just arrived, and found them "most barbarously used." It appeared that they had been raised in the open ground, in a strong alluvial soil, and had all their strong thick woody roots *docked short off*, to fit a small pot, for the convenience of carriage. Undoubtedly most of the plants which are imported are in no better condition than these; and this is sufficient to ensure the death of almost any plant during a voyage of three or four months. The plants are, for the most part, thrown away by the Chinese when they have blossomed once, as it is not believed they will flower again. At the time they flower, the officers of the East India Company are absent at Macao, to which place they generally resort after the sailing of the ships, so that they have no opportunity to see the plants themselves when in bloom, but rely upon the native residents at Canton. This circumstance accounts for the uncertainty which exists in regard to the number of the varieties, and the dissimilarity in color of the flowers.

The best account of the *Pæonia Moutan* which has been published, was by the late Mr. George Anderson, in the *Transactions of the Linnæan Society*. In that paper, which forms part of a monograph of the tribe, written in the year 1817, he adopted the single-flowered plant as the type of the species, and the two others then known and described as species, he considered as only varieties. In this he was some time afterwards (1824) followed by DeCandolle, who adopted his order of the plants; and subsequent writers have concurred with this method. The specific name, *Moutan*, was first given by Dr. Sims, in 1808. It was called by one or two writers, *P.* arborea; but the former name is now established, and we only occasionally see the latter applied in catalogues or minor works on gardening.

M. Arago, on Wednesday, in delivering a lecture on the theory of the central heat of the earth, related an operation at this time carrying on in Paris, which may be of the highest importance not only to science but to public economy. The municipality have ordered an Artesian well to be pierced near the Barriere des Martyrs; but the men employed, after getting to a depth of 900 feet without finding water, came to a stratum of chalk, so thick that the undertaking would have been given up, but for the interference of men of science, who wished it to be continued with a view to the above theory. According to observations made by means of a thermometer, *a maxima*, no doubt remains as to a fact, which hitherto it has not been possible to verify with any degree of precision, namely, that the temperature of the earth rises in regular proportoin towards the centre; so that at the tenth degree from the surface, all known matter must be in a state of fusion. At the point to which the perforation in question has reached, M. Arago expects a spring of water will arise of a sufficient degree of heat to warm public establishments, supply baths, and serve for other purposes. We cannot help thinking this expectation of M. Arago a very fanciful one.

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PROPAGATION AND CULTURE OF THE CARNATION.—Having obtained a quantity of good seeds, prepare a proportionable number of pots or boxes, filled with soil mixed with rotten cow-dung, &c., incorparated well together ; then sow the seed and cover them with about a quarter of an inch of the same compost, sifted finely ; place the pots or boxes in an airy part of the garden ; keep the soil moist, and shade them from the mid-day sun and heavy rains. The time for sowing the seed is about the first of May ; in about twenty days the plants will come up, and, if kept clear from weeds and duly watered, they will be fit for transplanting about the first of August, at which time prepare some beds of the same compost as they were sown in, in an open, airy situation ; plant them in rows, about ten inches apart in the row, and twelve inches from row to row ; during the winter, cover the plants with pine poughs, or any other light covering ;—by these means they will generally flower the following summer. When they begin to shoot up their stalks to flower, they ought to be supported by sticks ; and attentively looked after as soon as they begin to blow, to ascertain which of them promise to be good flowers ; pull up all single and ill colored flowers, to allow the others more air and room ; propagate the good ones by layers.

TO PROPAGATE BY LAYERS.—After you have made choice of such shoots as you intend to propagate, and have loosened the soil round the plant, and, if necessary, raised it with fresh soil, that it may be level with the shoot intended to be laid down, strip off the leaves from the lower part of the shoot, and cut off the top of the leaves ; make choice of a strong joint, the third or fourth from the crown of the shoot ; then with a sharp knife make a slip close below the joint, about three frouths through the shoot, from the joint upwards ; remove the swelling part of the joint where the slit is made, so that the part slit may be shaped like a tongue ; for if the outer skin be left on, it will prevent their pushing out roots ; then make a hole in the earth with your finger, just where the tongue in the shoot is to come ; put into the hole about a teaspoon full of silt, or fine sand from the river ; then with your finger and thumb gently bend the shoot into the earth, observing to keep the top as upright as possible, that the slit may be open ; and, having provided forked sticks for the purpose, thrust one of them in the ground so that the forked part may take hold of the layer, in order to keep it down in its proper place ; then cover the shank of the layer with soil, giving it a gentle watering, which should be repeated as often as it is necessary to promote their taking root. They will have taken root in about five or six weeks ; cut them off from the parent plant, leaving about an inch of the stalk below the incision attached, and plant them in pots or beds, or in the borders, as you intend to bloom them. The soil suitable for the carnation and pink is rich maiden loam, to which add one third part of well rotten cow-dung, and about one sixth part of drift sand from the side of the river, or other water courses ; to this add a small quantity of air-slacked lime, say a quart to a barrow full, and about double the quantity of wood ashes ; mix these well together several times in the autumn and spring, and use it the second season ; protect your compost with boards from the drenching rains and the mid-summer sun.

TO PROPAGETE BY PIPINGS.—The piping of the carnation is not attended with as much success as the piping of the pink.—Our warm weather, during the months of July and August, is much against this method of propagating the carnation ; even in England not more than one-half of the pipings that are put in ever take root ; and were it not that some of the best sorts make very little and very short shoots, and are also very brittle, and difficult to propagate by layers, I should recommend that the piping of carnations should be discontinued ; but, as the most difficult sorts to propagate are generally the most valuable, I will make a quotation from Paxton, which appears to me to contain the best information on this subject. Prepare a slight hot bed in an eastern aspect, and as soon as the heat is moderate, lay on about six inches thickness of light mould, sifted finely. No piping should have less than two or three complete joints.—Take off the cutting horizontally, just below the second or third joint, and merely cut off the leaves from the joint that is to be inserted into the soil, but leave the others entire, except the tops, which cut off square, a little above the centre of the crown of the shoot After giving the earth of the bed a moderate watering, place on a hand or bell glass to mark the boundaries in which the pipings are to be planted ; plant the pipings half an inch deep, and at least an inch and a half or two inches distant from each other. Many authors, and among the number Paxton, say, not more than an inch apart.—This I conceive to be an error, and one of the causes of failure in piping : by crowding too many pipings under the glass, they hold too much moisture, and damp off. After you have put in all your pipings, give them a gentle watering, to fix the soil closely about them ; let them remain uncovered until the leaves are dry ; then place on the glasses, and press them gently down to prevent the admission of air ; give the pipings a little morning sun, but always shade them when the heat becomes strong, which may be done by covering the glasses with mats. It is necessary, after the first week, that the glasses be occasionally taken off to admit air, but this must never be done when the sun is powerful, but rather in cloudy weather, or early in the morning. When the pipings are watered, never place the glasses over them until the leaves are dry, and then not without first drying the glasses, or mildew will be the consequence ; and this must be continued until the pipings are well rooted, which will be in about six weeks, when the glasses may be removed altogether. When there are any very choice varieties, I would recommend that they be piped with tumblers, and put only one piping under each glass. I have almost invariably succeeded in this manner, when the piping in mass has nearly, if not quite, a failure.

THE CULTIVATION AND PROPAGATION OF THE GARDEN PINK (Dianthus plumarius.)—The pink is more hardy than the carnation, and may be propagated with success, by dividing the roots in the spring ; but as these divisions never make such good plants, or bloom so fine as layers or pipings, it is a desideratum to raise new plants every year, either from layers or pipings, as one year old plants bloom very superior to those of any other age. When your pipings are prepared, make choice of a shady part of the garden ; let the soil be light and sandy ; put your pipings in after the same manner as recommended for the carnation, watering them with a fine rose watering-pot, until the soil is completely satured ; cover them with a hand glass, which should not be removed until they begin to grow ; after that they may be exposed in the morning and evening, until they are able to bear the open air. The usual time for piping the pink is July ; but I have succeeded much better when I have attempted it in September. Our dog-day weather is generally very much against the propagating of pinks by piping. The pink may be cultivated from seed in the same manner as the carnation, and in the same compost, with the addition of a little horse manure. Maddock gives the following as the *criterion of a fine pink :* "The stem should be strong and erect, and not less than twelve inches high ; the calyx smaller and shorter than the carnation, but nearly similar in proportion, as well as in the formation of the flower, which should not be less than two inches and a half in diameter. The petals should be large, broad and substantial, and very fine fringed or serrated edges, free from notches or indentures ; in short, they approach nearest to perfection when the fringe or edge is so fine as scarcely to be discernible ; but if they could be obtained entire, it would be desirable. The broadest part of the lamina, or broad end of the petals, should be perfectly white, and distinct from the eye, unless it be a laced pink, that is, one ornamented with a continuation of the color of the eye round it, bold, clear, and distinct, having a considerable proportion of white in the centre, perfectly free from tinge or spot. The eye should consist of a bright or dark rich

crimson or purple, resembling velvet, but the nearer it approaches to black, the more it is esteemed: its proportion should be about equal to that of the white, that it may neither appear too large nor too small."

The importation of the pink and carnation into this country, from England or from France, is very rarely successful; the close air and the scent of the ship is, in nine cases out of ten, fatal to the plants; hence these fine and odoriferous flowers are so little known or cultivated. We, indeed, find pinks and carnation of *a certain sort*, in almost every garden, but we rarely meet with a good one. I have met with specimens of the carnation, with high sounding name, admired by its owner for its great size; but if the colors of the petals had been green instead of "brick-dust-reded," it would have really passed for a cabbage-sprout.—With such specimens, how can we expect to enlist the cultivated mind and tasteful admirer of nature, in the cultivation of this lovely flower? The average price of carnations and picotees, in England, is about three shillings sterling per pair–pinks, one shilling and sixpence per pair, with a few exceptions for new and scarce varieties, which vary from five to twenty shillings per pair. I mention these facts, to contrast the prices asked and received by a gardner in this vicinity for one hundred plants of the carnation, warranted fine and of colors various!—Price paid, and I believe all that was asked, was *three cents each!* The result is, the purchaser is disgusted with his bargain; and if he had not an opportunity of seeing better things, he might have exclaimed, in reply to the following line of the poet,—

"And pinks of smell divinest,"
Carnations of shapes and colors vilest.

To engage our friends in the cause of Flora, we should supply them with things at a fair price. Taste, like truth, does not lie at the bottom of a well, nor is it confined to the rich or the poor, to the citizens or the yeoman, but is found in all countries, and among all classes of society.

In conclusion, dear Sirs, I would remark, that some good varieties of the carnation and the pink are to be found in the vicinity of Boston. A few years since, I did not know of a *first-rate* pink in the State of Massachusetts. We have now some ten to fifteen varieties of the best sorts. Mr. Hill, of Boston, has long been successful in the cultivation of the carnation; and it gives me pleasure to add, that some choice varieties are now under the care of Mr. Haggerston, at the seat of J. P. Cushing, Esq., at Watertown. A variety of fine pinks may be found at the Botanic Garden, Cambridge, under the care of Mr. W. E. Carter, and also at other gardens in the neighborhood. Among the best sorts cultivated in the vicinity of Boston, I would name Bow's Claud us, Major Shaw, Lady Cobbet, Lord Hamilton, Queen Caroline, Ford's fine seeding, Bow's Sir Isaac Newton, Navarino, Pettit's seedling, Hawkin's Beauty, a seedling raised by Col. Wilder, of Dorchester, and a seedling by the Messrs. Hovey, of Cambridgeport. The two latter I consider as possessing many, if not all, the properties which constitute a good pink. We may, therefore, hope soon to have more than one of our senses gratified; for

"Good scents do purify the brain,
Awake the fancy, and the wits refine."

Yours, &c.,

S. WALKER.

Roxbury, Aug. 16, 1836.

From the Genesee Farmer.

VAN MONS' METHOD OF RAISING FRUIT TREES FROM THE SEED.

We published a few weeks since, from the Boston Horticultural Register, Gen. Dearborn's introductory remarks to the account given by A. Poiteau, of the means which were employed by Van Mons to obtain excellent fruit from the seed. Omitting the speculative part of the article, we here give, as briefly as the nature of the subject will admit, the most interesting and useful facts, which were developed during the course of the experiments of Van Mons, with the hope that it may induce others to follow his example, even though it be on a very limited scale.

Van Mons' laid the ground-work for his experiments by collecting, during excursions through every part of the surrounding country, wild and natural stocks of fruit trees, which exhibited a favorable appearance, and which, from his familiarity with the characteristics, he was enabled at once to select. By means of these acquisitions, and repeated sowings from them, he had, in a few years, 80,000 fruit trees in his nursery, which enabled him to make his experiments on a large scale, and to obtain results more promptly and with greater certainty. "His repeated successive sowings," says Poiteau, "of annual flowers, and perennial shrubs which grew and fructified in a short time; his excursions to observe the wild type of our fruit trees, in places where they grew and reproduced in a state of nature; his new generations, which were obtained from wild and free or natural stocks, as well as from the first sowings in his nursery, his thousand upon thousand of observations collected from every quarter, have enabled Mr. Van Mons to establish a law which admits of no exceptions; this law is, that so long as plants remain in their natural situation, they do not sensibly vary, and their seeds always produce the same; but, on changing their climate and territory, several among them vary, some more and others less, and when they have once departed from their natural state, they never again return to it, but are removed more and more therefrom, by successive generations. and produce, sufficiently often, distinct races, more or less durable; and that finally, if these varieties are even carried back to the territory of their ancestors, they will neither represent the character of their parents, nor even return to the species [varieties] from whence they sprung."

Another very important conclusion at which Van Mons arrived from a long series of observations, was this:—While pear trees, in a state of nature, and in their native soil, always reproduce seeds, without any sensible variation; the seeds which a domesticated pear,—that is to say, one that has been for a long time in a state of variation in consequence of a change of climate or other cause,—yields at its *hundredth* fructification, produce trees not only very different from itself, but still very different from trees which have been produced from the seed of its *first* fructification; and the older a domesticated pear becomes, the nearer do the trees produced from its latest seeds, approach to a state of nature, without, however, ever returning to it. Having arrived at this conviction, he concluded that "by sowing the first seeds of a new variety of fruit trees, there should be obtained trees always variable in their seeds, because they can no longer escape from this state of variation, and which are less disposed to return toward a wild state, than those produced from seeds of an ancient variety; and as those which tend toward a wild state have less chance of becoming perfect according to our tastes, than those which are in the open field of variation, it is in the seminary of the first seeds of the newest varieties of fruit trees, that we should expect to find more perfect fruits."

The above quotation comprises the whole theory of Van Mons. "It was to verify it, and put it in practice, that from that period he collected in his nursery young wild trees, young free stocks,* and sowed large quantities of the seeds and stones, of various kinds of fruit trees, in order to have their *first* fruits, and sow their seeds in turn to obtain a generation, of whose novelty he was sure, and to take it as a point of departure for his experiments. Although Mr. Van Mons operated on thousands of various kinds and different varieties of trees at the same time, I will assume, in order to render what I say more clear, in explaining his progress, that he made his experiments on a single variety of pear.

"As soon as the young pear tree with which he began his experiments, produced its first fruit, Mr. Van Mons sowed the seeds. There resulted a first generation, the individuals of which, although of very different kinds, did not resemble their parent. He cultivated them with care, and endeavored to hasten their growth, as much as possible, by all the known means in his power. These young trees yielded fruit, which were generally small, and almost all of them bad. He sowed the seed of these, and obtained a second generation without interruption—which is very important—that were very different in kind, but did not resemble their parent, although they had a less wild appearance than their predecessors. These were cultivated with equal attention, and they fructified earlier than had their parent. The fruits of this second generation also varied us much as the trees which bore them, but part of them appeared less near the wild state than the preceding; yet only a few possessed the requisite qualities to entitle them to preservation. Constant in his plan, Mr. Van Mons sowed the seeds, and obtained a third continued generation, the greater part of the young trees of which had a *phasis* of good augury, that is, something of the physiognomy of our good domesticated pear trees, and they were consequently less various in appearance. Being carefully cultivated, as had been the preceding, these trees of the third generation fructified still earlier than had those of the second generation. Several of them produced edible fruit, although not yet decidedly good, but sufficiently amelior-

*That is, natural stocks from domesticated varieties.

ated to convince Mr. Van Mons that he had discovered the true path to amelioration, and that he should continue to follow it. He also recognized, with not less satisfaction, that the oftener the generations succeeded each other, without interruption, the more promptly did they fructify it. The seeds of the fruit of this third generation, which had a good appearance, were sowed, and the trees managed as carefully as the preceding, and produced a fourth generation, the trees of which were a little less varied, and nearly all of them had an appearance of favorable augury; they fructified in a shorter time than the third generation; many of the fruits were good, several excellent, but a small number still bad.—He again took the seeds of the best kinds of those pears, sowed them and obtained a fifth generation, the trees of which were less various than the preceding, fructified sooner, and produced more good and excellent fruits, than those of the fourth."

He continued his experiments till 1834, when he had reached the eighth generation, and at each he always obtained fruit more and more perfect.

"Mr. Van Mons made the same experiment on almost all the other kinds of fruits. The apple yielded no other than good fruit in the fourth generation. The stone fruits, as the peach, apricot, plum, and cherry, became perfect in a still shorter time; all of them produced good and excellent fruits in the third generation; which should be the case, for our stone fruit always reproduce more or less good without any particular attention, and therefore they should with less difficulty, and in shorter time, arrive at a perfect state of amelioration."

The *time* required to arrive at a satisfactory result, that is, the number of years before each tree would produce its first fruit, and the number of generations necessary to advance the fruit to a state of sufficient excellence, was a subject of anxious importance. Van Mons found that three or four generations in uninterrupted succession, embracing from twelve to fifteen consecutive years, were sufficient to obtain no other than excellent fruit from the stones of peaches, apricots, plums, and cherries; and to obtain none other than excellent apples, four successive generations, and about twenty consecutive years were required.—With the pear, the difficulty was greater. "At first, Mr. Van Mons was unable to procure the seeds of varieties very recently procreated; the seeds he was obliged to commence his experiments with, were obtained from ancient varieties, whose age was much advanced, which from experience tended to retard the first fructification of his young trees. Nevertheless, Mr. Van Mons has been able to ascertain that twelve or fifteen years was the mean term of time from the moment of planting the first seed of an ancient variety of the domestic pear, to the first fructification of the trees which sprung from them. The trees from the second sowing of the seed of the first generation, have yielded their first fruit at an age of from ten to twelve years, as the mean term; those of the third generation, at an age of from eight to ten years; those of the fourth generation, at an age of from six to eight years; and finally those of the fifth generation, at the age of six years.—Mr. Van Mons being actually at the eighth generation, has informed me that he has obtained several pear trees which fructified at *the age of four years*. From this decreasing progression, it may be seen that the fear of a lengthened experiment ought to decrease in proportion as it advances; and that adding the requisite years of the first five generations of the pear, a point is reached where none other than excellent pears are obtained, at the end of forty-two years. But if in each generation, as has been shown, there are always several trees which do not await the mean term named for their fructification, the time may be estimated at thirty-six years, for obtaining from the pear, in five uninterrupted generations, new trees and fruits, all of which are of excellent quality. The time can still be more abridged; for in one of his last letters Mr. Van Mons informed me that from two of his first sowings of pears, there were trees produced which fructified at the age of six years."

His method of treating his seedlings was as follows: He left them in the seed bed two years; he then took them up, threw away a part as worthless, and transplanted the most vigorous at a proper distance to allow them to develop themselves. He planted them sufficiently near to force them to run up tall, and to form pyramidal tops, without pruning; this hastens, he states, their fructification. This distance was about ten feet. While waiting for them to fructify, opportunity was afforded to examine the characteristics of their future excellence. It was generally not until they were four years of age, that they began to develop distinctly these characteristics.—From long continued observations, he was enabled to establish the following prognostics:

"1. *Prognostics of favorable augury.* A good form, a smooth and slightly shining bark, a regular distribution of the branches, in proportion to the height of the tree; annual shoots bent, striated, a little twisted, and *breaking clean without splinters*, thorns long garnished with eyes or buds, their whole, or nearly whole length; eyes or buds plump, not divergent, red or grizzled, leaves smooth, of a mean size, crimped on the side of the middle nerve, borne on petioles rather long than short, the youngest in spring, remaining a long time directly against the bud, the others, or the inferior, expanded, hollowed into a gutter from the bottom towards the top, but not their whole length.

"2. *Prognostics of bad augury.* Branches and twigs confused, protruding like those of the hornbeam, or broom, thorns short, without eyes; leaves averted from the bud, from their first appearing, small, round, terminating in a short point, guttered their whole length. These characteristics indicate small fruit, flesh sweet and dry, or baking fruit and late.

"3. *Prognostics of early fruit.* Wood large, short; buds large and near.

"4. *Prognostics of late fruit.* Wood slim, branches well distributed, pendent, the shoots a little knotted, generally denote late delicious fruit; with leaves round, point short, stiff, of a deep green, borne on petioles of mean length, are analogous signs, but less sure."

We close this article with an account of the severe disappointments which this distinguished man has been doomed to experience of late years. While pursuing his experiment on a very extensive scale in his nursery at Brussels, in 1819, the ground which was occupied by his vast collection of new fruits, was declared to be indispensable for streets and building lots, and he was summoned to vacate it in the short space of two months, under the penalty of seeing all his trees cut down and thrown into the fire. As professor of the University of Louvain, he resolved to remove his nursery to that city, that it might be more completely under his control; but the period assigned for evacuating his nursery, was unfortunately in the winter. His loss was consequently great and irreparable; and being obliged to confide nearly the whole care and labor of removal to others, it was with great difficulty he saved a twentieth part of his nursery. After his removal to Louvain, with the exception of having a great number of young plants kroken down and drawn out of the ground, by the masses of ice which were left upon it, after a great freshet in the river which passes though the city, and which overflowed his nursery to the depth of seven or eight feet, he enjoyed more or less quietly this new location during the following thirteen years. His correspondence was renewed and extended, his losses were replaced by new acquisitions, and the mass of his observations was augmented, and his new varieties were liberally disseminated. "But," observes Poiteau, "*publie utilite* had sworn that she would finally embitter his old age. In 1831, we besieged the citadel D'Anvers, and although Mr. Van Mons' nursery was fourteen leagues distant from the army, the engineers could not find a more commodious place than that nursery to bake the bread of the soldiers in; consequently a great part of his trees were destroyed, having constructed their ovens on the ground where they grew, and the fruit of the others was exposed to pillage. Still the philosophy of Mr. Van Mons sustained him in this unexpected devastation; he hired two other tracts of land into which he removed his young plants; he was consoled because he had time to collect, although it was summer, scions of the trees which were sacrificed to afford a place for the erection of ovens; but *public utility* had not yet exhausted all her severities against him.—Unfortunately, there was not a Chaptal in the council of the prince, and the engineer, seeing nothing, decided again in 1835, in the name of *public utility*, that Mr. Van Mons' nursery was the sole and only point on the globe, proper for establishing a gas house for lighting the city. Heaven grant that these gentlemen may be enabled to see better for the future; but it is not in their power to prevent the true friends of intellectual light, and of public prosperity, from regarding their decision as an act of ignorance and the grossest vandalism.

"Mr. Van Mons is actually seventy

years of age; he has consecrated his whole, all his life, a large part of his fortune, to public utility, and yet it is in the name of *public utility* that they have slain him, assassinated him! O age of light, how dark thou art!

"In the commencement of September, 1834, Mr. Van Mons, on sending me a box of pears, which were the first of a seventh generation, observed in his letter, 'when you taste these pears the trees which bore them will no longer exist.' In fact, I learned a few days after, that the destructive axe had prostrated these trees and many others, that the nursery was dishonored, lost, and Mr. Van Mons frustrated in his dearest hopes, which were to send us the products of his labor.

"It is impossible to foresee, or rather I dare not express my fears, as to what will become of the ruins of an establishment, which wanted encouragement, which was of a nature to elevate the glory of an empire."

A note is added, stating that he had been ordered to evacuate the whole of the land before the end of February.

From the Burlington Gazette.

THE SILK BUSINESS.—We give the communication below a prominent place in our columns, not less because of the importance of the subject, than of the able and practical manner in which it is likely to be discussed, and we tender to our correspondent our hearty thanks, and in this we feel sure that our readers will join us, for the favor which he promises to confer on us and them. We are fully persuaded that nothing is needed but facts, such as our correspondent will communicate, to arouse public attention to this too long neglected subject, which, there can be no reason to doubt, will ere long have an important bearing on individual as well as national prosperity. We fully concur with our correspondent in the opinion, that there is no place more favorable for the prosecution of this business than Burlington and its vicinity.

Editors of papers in different sections of the State, who may wish to excite among their readers an attention to this subject, are referred with confidence to the present and forthcoming essays of our correspondent, as well calculated to attain that object.

THE SILK BUSINESS.

No. I.

To the Editor of the Burlington Gazette:

SIR,—I have read with great satisfaction the notice in your last paper, that application will be made to the next Legislature to incorporate a company, with sufficient capital, for the purpose of cultivating the Mulberry and raising Silk. No better district of country could be chosen than the township of Burlington, as respects climate, soil, and the facility for procuring help in any quantity during the busy season.—Elizabethtown and Belvidere have entered largely into the business, with no greater facilities than we possess—and to them, and to ourselves, it requires no prophetic gift to promise that success which an enormously lucrative business is sure to afford. I do not know the gentlemen who have come forward with this enterprize for Burlington, neither have I any interest in the undertaking, beyond the very great gratification it would afford me to see the ancient name of *Burlington* among the conspicuous Silk-growing districts of the Union.

It is possible that some of your readers may smile at the mention of a *Company*, with a large capital, embarking in the business of raising Silk. It is natural that many of them should, for the subject is new; and but little information has been disseminated through the country generally, respecting it. Allow me, sir, to use your columns, to lay before your readers a multitude of facts in my possession, so strong, in the aggregate, as, I hope, will make the smile of incredulity give place to that of satisfaction. But this necessary information cannot be communicated in a single number. Your own zeal for the welfare of ancient Burlington will bear me out in giving room for future essays; for I need not point your attention to the absolute necessity of a correct and ample view of the importance of the Silk business being given to the community, where such an establishment is about to be locaated.

Let us, in the first place, look to the vast extent to which the Silk trade is carried in foreign countries. England is comparatively a new hand at the business—yet its importance to her is immense. Two millions of pounds of raw and reeled Silk are annually imported by her, the manufacture of which is estimated to maintain, by the mere wages of labor, four hundred thousand persons! Fifty thousand looms are at work. In France, the value of the business is infinitely greater. The amount of manufactured Silk exported, in 1835, is almost incredible. From official documents it appears to have reached the enormous sum of $22,700,000, and that *one-third* of this vast sum was brought to the United States—equal to $7,566,666! The importations into the United States from other parts of the world, swelled this sum to sixteen and a half millions of dollars for the same year. Every dollar of this might be kept in the country, by pushing the business as our soil and climate invite. Perhaps a million of our citizens might be constantly employed, if the supply of *raw silk* were equal to the demand for the manufactured article.

Now, it is important to remember, that the soil and climate of this country are as favorable to the growth of the Mulberry, and the health and development of the silk worm, as the most productive Silk countries on the earth. Experience has proved many important facts—that the leaves of our *native trees* produce the finest Silk, not only as regards quality and color, but the *strength* of the thread. Even the weight of the cocoons is said by some practical hands to exceed the weight of those of foreign countries. The Mulberry, the food of the Silk worm, grows every where, and grows with great rapidity. The late Joseph Cooper, of Camden, N. J., planted a number of trees, and at the end of twenty-three years, found they measured near *seven feet* in circumference—and during twenty years of that period, each tree would have supported a large family of worms. In Massachusetts (a much colder climate than New Jersey,) 1500 cuttings were set out, about 1000 of which flourished, the remainder being killed by a severe spell of dry weather. The ground was by no means rich; yet the very next year they yielded 55 pounds of leaves from 100 plants, or, at the rate they were set, 8000 pounds to the acre, sufficient to make 100 pounds of Silk.—From 100 trees started the year before, 150 pounds of leaves were gathered, affording, at the same rate, 12,000 pounds to the acre—or 150 pounds of Silk. Now this silk is worth $4 50 per lb *in its raw state*. Hence, we have a return so enormous, even after deducting the cost of raising the cocoons, and reeling or throwing the Silk, as to astonish us that this business was never introduced into this country before.

Let me tell you, too, that a *child* of twelve years old, or an aged person unable to follow any active or laborious employment, will feed as many worms, during the Silk season, of six weeks, as will produce twenty-seven pounds of reeled silk. When I reflect upon the blessings that would be conferred upon a thickly settled neighborhood, by the extensive introduction of the Silk business, it appears to me that no effort should be spared that would accomplish so desirable an object. As it is emphatically an employment of a *domestic* character, how many deserving families, reduced to depend upon their daily labor for the necessaries of life, either by the vices or misfortunes of their natural protectors, might be profitably employed throughout the year, in reeling the Silk from the cocoons. Aged females and families of young women, might be released from the painful and ill-rewarded labors of the needle, and even young children, too juvenile for *work*, and idle because their parents are too poor to educate them, might be profitably employed in preparing the tiny fibre of this wonderful insect for the loom. Cannot the reader of this recall to his remembrance some destitute family—some widow with a numerous group of suffering children, to whom a domestic employment of this kind would indeed be a blessing? Or some lonely and aged female, too feeble for labor, too good for a poor-house, whom a steady fireside occupation at the silk-reel might lift up into the sunshine of a grateful independence? Considerations of this kind expand the sympathies of the human heart, and make the subject as interesting to feeling and philanthropy, as it ought to be to private interest or commercial enterprize.

In the present number, little else could be done beyond stating the question for elucidation. In the next, some facts will be furnished of a more practical character, so plain that he who has the dullest perception of his interest, shall not fail to understand them, and sufficiently explanatory of the subject as to be within reach of all who are willing to learn.

From the Farmers' Register.

ON CURING TOBACCO.

I ought before to have redeemed a pledge I gave in a former communication, that I would, in due time, say something upon the subject of curing tobacco. But the great draught on my time, which is unnecessary here to state in detail, has prevented it.—And, indeed, there are so many cultivators who eclipse me, and (by close personal attention, which I cannot give on account of the extent of my business,) understand the minutiæ of it better than I do, that I really feel some delicacy in the attempt. I will, nevertheless, endeavor to explain the general principles upon which the process ought to be carried on, which, in truth, is nearly all that can be done in the compass of a communication not too long to be read. It may be of some use to those who are novices in the business.

In the first place I will remark, that the sap in tobacco contains more oil than any plant with which I am acquainted. The whole art, then, consists in evaporating the water from it, so as to leave it in the purest possible state, and the greatest quantity.—To effect this, it is all important to let it be as ripe as possible before it is cut. I believe it may be assumed, that nine out of ten cut too soon, though the number of them has been diminishing, since the dealers in the article have taken up the habit of admonishing them. The first step it takes is to assume yellow spots. This should begin in the field, if it does not fire so much as to make it necessary to save it from destruction, and many are induced to cut it for this cause, when perhaps a change of weather, from wet to dry, might stop it, as it frequently does. But this question can only be settled by observation and reflection. Although it assumes the yellow spots in the field, it is still proper to let it stand two, three, or four days, according to circumstances of heat and moisture in the atmosphere, when if it ripened green in the field, which it will sometimes do, it should begin to assume the e yellow spots in the house. The firing should then commence in a very small way, and be very gradually increased for several days, till it will bear such a degree of heat as will cure the thin parts of the leaf, and the small fibres. It should then rest a day or more, to allow the stems and large fibres to diffuse the sap which is in them, and afford an opportunity to evaporate the water, and leave the oil in the leaf, where it ought to be. But when the process of firing is commenced, the tobacco should never be allowed to get in high order till the stems are cured. After this is done in great measure, it is well to let it rest again, and send out the remaining sap to gain as much oil as possible in the thinner parts of the leaf. Let it be noted, that whenever the tobacco suffers for want of fire, it will be known by the "strutting" of the leaf, which should never be suffered after it is first "limbered" by the sun when it is cut. The strutting of the stem is produced by the flowing back of the sap from the leaf into the stem which it has a tendency to do when it requires heat. It is this which impoverishes the leaf along the stem. During the early part of the process of curing, care should be taken to let it have air, otherwise it will sweat, and the oil will be cooked in the water, instead of the water being evaporated from it. To this end it should be hung thin, say, in large tobacco, not more than nine plants on a stick, and the sticks 8 or 9 inches apart at least, according to the size of the tobacco. During the first resting spell indicated above, if house room be scarce, it may be re-hung by putting the plants from four sticks on three, or three upon two, as the case may be. This saves room and fire too.

The reasoning above is to show the necessity of heat in curing. As far as the sun can be substituted for fire, it is proper to use it, more especially when it is first cut, when it should be kept on a scaffold as long as it is safe from rain. But when there is a very full crop for the hands, it is hazardous to trust to much out at once. The judicious planter will regulate this by circumstances. I once saw a crop of eight hogshead sell for nearly double the price of similar tobacco, because it was cured by natural instead of artificial heat, in houses entirely open (as it was said) on the south side, the weather being favorable to the object. It is unnecessary to state that the manufacturers prefer that which is cured with as little fire as possible. It is difficult, however, to cure a large crop without a good deal of fire. It may be well to observe, that tobacco, like bacon, is cured in a variety of ways, by different persons; while some will be good in each way.

There is little doubt that the foregoing observations will be criticised by some who may perhaps understand the subject better than I do. If so, my object will be attained by eliciting the practice of others. Something may be gained by adopting parts of each, or letting each pass for what it is worth.

While I have dwelt on the quantity of oil contained in tobacco, I have said nothing of another ingredient which it contains in large proportion, viz: saltpeter. It is very common in rich tobacco, to see it exude from the stems so as to make it white with pure saltpeter. This, however, when it is seen on fine tobacco, is a proof that it was not sufficiently fired; because it ought to be expelled from the stem and circulated in the leaf, where it should be incorporated in the oil. As a proof of the quantity of this ingredient, I will mention a fact within my own knowledge. During the revolutionary war, my father was in the habit of boiling his tobacco stalks, and pouring the water into a number of rough trays, with pens of sticks rising to the surface of the water, to which the saltpeter attached itself in delicate spangles like icicles. This was stroked off into a dish in its pure state. In those days, there was more carelessness in curing than at present, otherwise the saltpeter would not have been allowed to remain in the stalks in so large quantity.

Before I close this communication, I must warn such as gave credit to my former communication on the subject of packing plant land for burning at a future day, that in several instances my last effort failed.—In the month of October a rain fell, which wet the land under the brush and wood more than I had supposed. A threatening prospect for more induced me to set fire to them, and several that were wetter than the rest made a poor turn-out. If I had waited till November, as I generally do, a dry spell had put them in fine order. Another evil also a tended them. The unprecedented quantity of rain which fell during the winter, forbade my chopping them lightly again before sowing, and the ground became too compact. This would not have been the case if they had been made rich enough. I shall hereafter endeavor to pen my cattle on them in the spring before the grass seeds, and before the brush and wood is put on, or make them much richer with manure that has no seed in it. A PLANTER.

We think our southern farmers would be well repaid for cultivating the beet as a renovation of the land when worn, particularly tobacco lands.

From the Farmers' Register.

IMPROVEMENT OF WORN LAND.

I submitted some reflections on the improvement of worn land some time since, with the determination that I would persevere in the attempt to improve my own farm, one of the first settled in my county.

I have advanced, as I said I would, step by step. The thin land, such as would produce not more than a barrel of corn to a thousand hills, I have been manuring for tobacco, and last year made a respectable crop on such land. It is a soft free land, and susceptible of improvement. At the fall, the land was sown in wheat, and in February in clover; the crop of wheat is good, and the clover very promising.

A piece of land adjacent managed in the same way the year before, a part of which was very much exhausted, has produced an excellent crop of clover, much mixed with herd's grass, (the product of seeds brought in manure from the stable.)

I am now perfectly satisfied that our exhausted lands may be restored to their original fertility; and so confident am I in the success of the undertaking, that it is a matter of choice to pitch a part of my tobacco crop in such land every year. Indeed, if we were to change our system, and cultivate all of our highly manured tobacco lots in grain and grass, we should do what is but sheer justice to our native land. Tobacco mainly killed the soil, and tobacco is justly chargeable with expense of restoring it.

The improvement of land for corn to much extent, is not to be expected in the present circumstances of the country. Tobacco is the staple crop, and all the manure that can be raised is in requisition for tobacco land. Now, if the thinner land is manured, and cultivated in tobacco, I feel no hesitation in saying, (preposterous as the advocates for manuring the richer lands may think it,) the product will be in favor of the poorer land. The tobacco will be respectable, the wheat, and clover following, luxuriant, and the land raised in value 200 per cent.

The manuring of such land should commence early in the fall, covering the land with leaves, or such litter as can be conveniently had, in addition to which, the stable or farm-pen manure is indispensable. The first manuring will then be effectual, putting the land in heart for what is to follow.

In these remarks, I wish not to be understood as recommending the improvement and cultivation of the most exhausted land, to the neglect of a better subject for improvement. Any lands that are turfed and would produce more than a barrel to the thousand hills, would certainly be preferable, requiring less manure. The opinion is fast gaining ground, that lands that have long been abandoned as commons, and grown up in pines, &c., if taken up and judiciously managed, produce the finest tobacco. The reason is obvious; these lands were originally the richest; our fathers cleared their best lands first, as in all new countries, supposed they could not injure them by cultivation. The same system is progressing in Mississippi, and the same result may be expected.

Several of my neighbors have tobacco in lands that produced little or no corn when last cultivated; the lands have been manured by no means heavily, and from present prospects, the tobacco promises to be good. They covered the land with leaves in the fall and winter.

The improvement of land will advance with the facilities of intercourse; roads, canals and the navigation of the rivers, are now receiving more attention. The public highways are under the management of the county courts, and to improve them systematically, the Legislature has wisely thrown the responsibility on each county to make such improvements on such roads as they may think proper. May we hope they will use the power granted for the good of the Commonwealth? Will the people shrink from a public duty wisely imposed on all males of sixteen, and under sixty? I cannot think they will.

Virginia presents a wide field for all the improvements of the day. It is a dear land to all her sons. The traveller to the distant west, can tell his own feelings best, when after a long and wearisome journey he enters on the Old Dominion: his Virginia feelings are awakened, his attachment is renewed, and all his speculations become insignificant, when he thinks of having to leave his native land; but restless spirits must and will go—"there is much land to possess," the land was made to be peopled, and so let it be.

But to the question—What is gained by removal to the west? A man who has a large and expensive family, desiring to settle his children, may, for the sake of them, meet the sacrifice of the conveniences of an older country, his own comfort, and go. But can he look at the expense of building such houses as he will leave, and clearing the heavily timbered lands of the west, and not see that the same amount expended in improving a good old Virginia estate would be as profitable? It is estimated to cost about $10 to clear an acre of land in the west; add to this the lowest price per acre, $1 25, and then erect such houses as a permanent settlement requires, and you have the cost of a western estate.

Has it occurred to many readers of the Register, that it is about as easy to improve an acre of land as to clear one? The felling of timber, grubbing the undergrowth, hauling rails to fence the land, the coultering and and putting in order new land for a crop, consumes more time than to litter the same quantity with such means as may be had on most farms. *It is worthy of experiment.*

The friends of agriculture have much to encourage them; they should renew their diligence and utterly disregard the sneers of those who ridicule all improvement.—The grand canal of New-York, with the able Clinton at the helm, was considered a most preposterous undertaking. Clinton was driven from the distinguished station of Commissioner, but the work went on, was accomplished, and serves as a monument to perpetuate the fame of its projector.—Yes, a more durable monument than the pyramids of Egypt, or such an one as is proposed to honor the immortal Washington; a structure to look on rather than to answer any useful end, more to signalize the folly of the people, than to honor him who has all honor, who will live forever in the memory of a grateful people, without the adventitious aid of a sculptor or painter.

A system of improvement simple and practical, the community demands; and if, sir, the Register should be the instrument of setting in motion, (as I believe it will,) the real improvement of this once fertile Old Dominion, the State will remember the efforts on your part to accomplish the end in view.

S. D. M.

From the Farmers' Register.

REMARKS ON THE (SUPPOSED) GYPSUM DISCOVERED IN NEW-YORK, AND THE PROBABLE EXISTENCE OF A SIMILAR SUBSTANCE IN WESTERN VIRGINIA.

Big Lick, Botetourt, Aug. 6, 1836.

I have met with nothing recently, which has surprised or puzzled me more than the recent developements in New-York, respecting the rock in Moore's well, and the principal *plaster* beds in the State. It brings to life exploded theories, which, a few years since, had many supporters in the Valley of Virginia.

There are numerous localities in this country, where the limestone crops out at the usual angle with the horizon, but from peculiar causes, not well understood, is subject to constant and rapid disintegration. It is softer, and from the inexhaustible fertility which it imparts to the ground over which it is scattered, it has been supposed by many, to possess the virtues of gypsum. By the farmers it is called rotten limestone, and some have had it pounded, ground, and sown, as is customary with plaster, and claim for it equal activity. The experience, however, is so limited and contradictory, and the lights of science so adverse to its efficacy, that until the arrival of your last No., (3rd,) I have had no hesitation in attributing, what seemed to be the effect of the powdered carbonate, to other influences I cannot, for a moment, believe, that either the carbonate or sulphate of lime, sown over the ground in the usual quantities, can be of any value, mechanically. Their attraction for moisture, when pulverized, has had an importance attached to it which ignorance alone could have encouraged; for, aside from their solidifying what they absorb, how trifling inconsiderable must be the moisture attracted by a few handfuls of dust scattered over an acre of ground.—Gypsum being soluble in from 300 to 500 parts of water, and being found by analysis an important constituent of those plants upon which its action is most striking, enables science to unfold its mysteries with tolerable clearness. But the *carbonate* being insoluble, seems to cast an impenetrable veil over its *modus operandi* if we admit its influence upon vegetation to be the same with plaster. We are always backward and unwilling to admit what seems to be at war with the settled principles of science, and yet we are every day encountering stubborn facts, before which, speculation must give way, and to which, principles, however revered for their antiquity, or stamped with value by the approbation of the wise and the learned, must accommodate themselves. Now, it has been a received opinion, that the carbonate of lime is insoluble; the correctness of which, is sustained, not only by the ordinary chemical experiment, but by the fact that the soil throughout the Valley of Virginia, and other timbered calcareous regions, even when lying in immediate contact with limestone, affords upon analysis, not the slightest evidence of the existence of lime. For this last remarkable fact, we are measurably indebted to your experience.* In vegetable physiology too, it is unquestioned that plants receive their nourishment, either in a gaseous form, by absorbing it through the leaves, or by imbibing it in a liquid state, through the minute spongeoes which terminate the roots. From all which facts, viz: its quality (i. e. the carbonate of lime) solidifying the moisture it absorbs†—the absurdity of

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*The *carbonate* of lime—the form, which is presented in limestone—was found to be almost always absent, in such cases as are above named—and such was the novel and strange fact stated in the Essay on Calcareous Manures. But *lime*, in some other combination than the carbonate, was supposed to be always present in soils touching limestone.—See pp. 20, 21, 2d Ed. ED. FAR. REG.

†Water is not *solidfied*, when absorbed from the atmosphere, either by pulverized carbonate of lime, or gypsum not calcined—as any so absorbed is not chemically combined with either. The power of absorbing water, in both, is by such action as any pulverized matter would exert, and is but feeble, compared to some other earths, or mixtures of earth with putrescent matters. But pure or quick lime, combines chemically with a a certain and a considerable proportion of water, in slaking, and solidfies it, as the slaked lime may be as *dry* as any thing can be, and yet hold this large proportion of water. All gypsum is already supplied with its solidfied water—it forming one of its uniform component parts. This

expecting a mechanical effect from the small quantity sown over the surface, its insolubility, and the impossibility of any substance acting directly as a *pabulum*, or by stimulating and exciting the digestive organs of the plant, which is not soluble, it follows that the carbonate of lime can exercise no influence upon vegetation, unless put upon the soil in such quantities as to change its constitution by mechanical division. Such is the conclusion to which the lights of science would seem to lead us. In opposition to which, we have the fact before us, whichever way we turn, that the springs which rise in, and the streams which flow through that country, the soil of which affords, upon analysis, no lime, are strongly impregnated with it, and deposite it in the form of argillaceous marl wherever the stream is small, and exposed by ripples to the action of the atmosphere. Even those immense parapets of *travertin* in the neighborhood of the Sweet Springs, which excited the amazement of our U. States Geologist, Mr. Featherstonhaugh, and which he seemed to consider, in his communication to you, as almost anomalous, but which are by no means uncommon, are the undoubted deposites from the streams in their vicinity, which must have imbibed their calcareous qualities somehow or other, from the soil through which it percolates in forming springs.—This would seem to say lime was a constituent of the soil, and without question exhibits it in a dissolved condition. Whether in the secret laboratory of nature it undergoes modifications, we cannot detect, or how it happens, it is impossible to say; but so it is.* Other facts opposed to the *scientific* theory of lime, are afforded by the interesting communication alluded to in the first part of this letter, respecting the plaster beds of Chillenango, Phelpstown, Wheatland and Cayuga, in New-York, in connection with the experiments which have been recently made upon the calcareous rock taken from Moore's well; facts which, if true, involve a contradiction, while they confirm the impression in this neighborhood, that the rotten limestone is as efficacious as plaster.

Your New-York correspondent calls upon you to clear away the fog which surrounds him and his fellow citizens on this subject. With equal propriety, may we of Botetourt call for aid in this truly perplexing matter—not only perplexing, but deeply interesting; for, if it be true, as your correspondent suggests, "that the mechanical operations of grinding or pulverizing crude or unburnt limestone, renders it equally fertile with gypsum," the benefits which will flow to this country, from its discovery, can scarcely be estimated.

W. M. PEYTON.

P. S. Since writing the above, I have received your 4th No., and find that the opinion of your New-York correspondent respecting the rock from Moore's well, is confirmed by the analysis of Professor Silliman. I am surprised that the singularity and importance of the circumstances connected with his experiment, did not attract his attention. He has left us, from our confidence in his skill and science, in a most inextricable labyrinth. He suffers the anomalous character claimed for it to pass without comment; and proves, by analysis, that it is not only a mere carbonate, but that it contains only 50 per cent. of lime, the residue being an aluminous residuum, without the least plaster of Paris. I hope the remarks in your 4th No. will meet his eye, and induce him to investigate and treat the subject with that fulness and perspicuity for which his abilities and science so eminently qualify him.* W. M. P.

August 7th, 1836.

NOT CONQUERED YET.—We were regularly beaten last summer in the vegetable competition. Our large New-York turnip, which we thought big enough to make a noise about, was annihilated by one raised in Pennsylvania, and chronicled in the United States Gazette; and both were driven out of the field by a product of some down-east turnip patch, which weighed five or six pounds more than the Pennsylvanian. We were as completely discomfited, as the Baltimore Convention candidate will be at the next Presidential election.

Natheless, we are prepared for a rally in vindication of our State's agricultural honors. We have hanging up on the wall above our table, the biggest cucumber we ever saw, although they may have larger in Philadelphia or New-Bedford. Its length is 19 inches, and its circumference about 11; and it looks particularly ripe and nice, if we could but dare to eat it. This vegetable monster, with a superb bouquet of dahlias, and three clusters of rich ripe grapes, was presented to us on Saturday by Mr. James C. Church, of 193 Clinton street, in whose garden they were raised.

TOMATO.—This valuable vegetable, by recent investigations of medical men has been found to be a sovereign remedy for dispepsia or indigestion, and to give great relief to persons troubled with too much bile. This discovery was published last summer, and so greatly increased the consumption of the tomato, that it doubled the price in our markets. We hope our farmers will immediately take measures to ensure an extensive cultivation of this article the next year. A gentleman residing on Long Island assures us, there is no vegetable that can be raised with less trouble or in greater quantity than the Tomato, and there is none which will pay the gardener half so well for his labor.

There can be no loss on this vegetable, for raise as much as you may, what is not sent to market can be converted into catsup, and will bring a price that will fully compensate the gardner. It is said, one gentleman cleared $1,800 by rearing this article on a small farm near this city.—There can be no doubt from the publications which have been made as to the medical qualities of this vegetable that its consumption will be quadruple the next year what it was the year preceding.

MEDICUS.

From the Southern Planter.

TURKISH PREPARATION OF TOMATO.

Sir:—In one of your late numbers I observed a notice of the tomato, by one who appears to appreciate the vegetable at its just value. Without, however, agreeing with your correspondent in all claims to excellence as an important article of the Materia Medica, I conceive have nothing to equal it in giving pungency and flavor to our commonest dishes. It is a great desideratum to have it at all seasons of the year, and some of your readers will doubtless feel obliged by learning how to obtain it in simple, easy, and economical manner.—In Turkey, it is a universal favorite, and enters into the compositien of all their sauces. I frequently saw it made, and the following recipe may be depended on, as it was corrected under the eye of the good house-wife herself.

The tomatoes are first washed in a weak brine and hung up in a cool place to drain, until the following day; then squeeze them thoroughly by the hand, throwing away the skins. The pulpy mass is strained through a fine cloth to prevent the seeds from passing through it, it is then salted, put into shallow earthen dishes, and exposed to the sun for twelve days, or until it becomes thick paste. It should be stirred with a wooden spoon, twice a day, while exposed to the sun. It is then fit for use. With respect to the quantity of salt to be added to the paste, the rule is to put a handful and a half to the pulp of a hundred tomatoes, if large, and less if small.

Those who prepare tomatoes in this way will be surprised at the small quantity obtained; but their surprise will cease when they learn how far it will go. A bit not larger than a Lima bean will be sufficient

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water is dispelled by calcination, and would be again absorbed (and in that case solidified) if the calcined gypsum was scattered on the surface of the earth. ED.

* The carbonate of lime is indeed, as stated by our correspondent, insoluble in *water*—but *is soluble* in water impregnated with carbonic acid. Besides the various other natural means of carbonic acid being given to earth and water, all rain water contains some, as it falls to the earth—and therefore, there are abundant means thus furnished, by which carbonate of lime (then become the super-carbonate, by being combined with excess of carbonic acid,) may be dissolved, and held in solution in water. It is in this state that all limestone water holds lime.—And when the excess of carbonic acid is expelled, (as is easily done,) by heat, or by exposure to the atmosphere—which last occurs mostly at the water-falls and ripples—then the lime, restored to the state of carbonate, being insolable, is precipitated, and forms a deposite of soft limestone, or *travertin*.

*We concur heartily in the wish of our correspondent to obtain light from this abundant source. As the matter now stands, with Professor Silliman's statements of the analysis of the earth in question, the facts are incomprehensible—and would be to us incredible, except for the supposition that there are causes of action not yet discovered. ED.

to flavor the soup of a family of twenty persons; and a much smaller quantity for sauces. A small pot which I brought with me, containing about half a pint, lasted my family more than a year, and we used it very freely.

By stirring it frequently, fresh potations are exposed to the sun, and the salt is more thoroughly incorporated with it. The rule of twelve days holds good at Constantinople, and I think would be sufficient here. At any rate, it should be thoroughly dried, covering it over at night, until it becomes of the consistence of hard butter.

I have planted a large quantity of tomatoes, and shall make the sauce according to the above recipe. Should an opportunity present, I will forward a small specimen in order that you may knowingly recommend it to your readers. D.

[From the Farmers' Register.]

DIFFERENT EFFECTS, COMPARED, OF THE GREEN SAND, CALCAREOUS MARL, AND THE MIXTURE OF BOTH.

[We are much gratified in being able to present the following practical statements upon a subject which is not only mysterious in itself, and has as yet been inexplicable, but which has been rendered still more obscure by all the mass of writings on the subject. Imperfect and defective as are the following statements, if considered as *data* on which to found a theory of the action of green sand, they are the first which we have seen, of undoubted authority, which throw much light on the subject. Our correspondent generally and correctly discriminates between what are indeed three manures of very different kinds, viz: Green sand alone—calcareous marl alone—and any mixture of the two. These have been so generally confounded under the one general name of *marl*, that facts have been misconstrued, and therefore false deductions necessarily made, even when there was no other cause for error. Our general views on the difficulties of this subject, were stated at page 86, vol. 4, and therefore will not be here repeated. We will only request of our correspondent that he will refer to those observations, and state whatever his experience may offer in confirmation, or in contradiction, when he writes his promised continuation. Almost every thing is yet to be learned respecting "green sand."

It is inferred, from our correspondent's remarks, that in all the extensive marlings on the borders of the Pamunky, the green sand has been largely intermixed with the calcareous matter. On the contrary, all the marlings referred to in the Essay on Calcareous Manures, or that had been then executed or known by the writer, were of calcareous marl alone, with the exception of the small portion mentioned, (p. 48, 2d ed.) as being dressed with what was called the "gypseous marl" lying under Coggin's Point—which marl was there treated as a substance of rare, peculiar, and valuable qualities, and which in fact is rich *eocine* marl, containing green sand as well as gypsum.]

CHERICOKE, KING WILLIAM Co., June 9th, 1836.

Dear Sir—In your favor of the 24th ultimo, you request that I will give you my views respecting green sand marl, for publication. As upon the score of giving and receiving agricultural information, and particularly upon the subject of marls, I am much your debtor, I feel disposed to comply with your wishes: if, indeed, any thing I can have to say, may be thought worthy of the public notice. And, indeed, I should not have waited your request, had I thought that the results of my experience in the use of marls, would have at all been interesting to any one, or have made one convert to its use—as there is no one more alive to the interest and welfare of his country than I am, or more anxious for its agricultural improvement—nor can any one be more satisfied of the utility, nay, the necessity there is, of the use of calcareous manures with our soils, to enable us to arrive at a profitable, much less a high grade of agricultural improvement.

Your views (as contained in your Essay on Calcareous Manures,) respecting our soil, and the nature of putrescent manures, entirely accord with my experience: and practical results, I look upon as the only sure test of all theories. There is certainly no abiding principle of fertility in putrescent manures alone, nor do I believe land can be carried to more than a certain degree of fertility by their use; but by the addition of calcareous matter, I think it would be difficult to affix limits to the degree of productiveness that may be arrived at. You will doubtless say I am an enthusiast: well, perhaps I may be somewhat sanguine in my temperament, but zeal I think is a good fault in a farmer, particularly where it is tempered with reason and experience—and I shall say nothing in which I am not warranted by my own observations of cause and effect. And certain it is, that unless agriculture can be carried to a much higher grade of profit, than it has hitherto attained among us, the Old Dominion must be abandoned, sooner or later, by at least the present occupants. But I find I am fast getting off from the subject of your inquiries, and must therefore rein in my pen, and come back to the starting place, which was, I think, my experience, or rather views, respecting the green sand marl.

My experience with the green sand is limited, perhaps too much so to say any thing about it; but the green sand marl I have been using for 4 or 5 years; indeed, all the marl on this river (Pamunky) is of that character; different locations differing greatly, as to the quantities of the different ingredients. Some of the locations contain a large per centage of gypsum; some are of gypsum and green sand. Some contain the two former, with lime in a goodly ratio. Some, perhaps much the largest deposites, contain no gypsum, but about equal quantities of green sand and lime, say 34 or 35 parts of each. What Professor Rogers calls the pure green sand, contains but little lime, and no gypsum; but you find interspersed among it all, as far down as I have gone into the lower, or third stratum (reckoning downwards,) of the tertiary formation, more or less of shells, and differing from the stratum above it in the shells being generally whole, but easily broken with the fingers. Some very large and perfect specimens of the *cardita planicosta*, and many very minute shells of a different species, but also perfect—whereas the stratum above it is exceedingly rich in lime, containing perhaps 60 or 70 per cent. of shells, almost all decomposed, or in a state of lime, with much green sand. In the most abundant deposites, above referred to, containing about equal parts of green sand and lime, the particles of green sand are about as large as fine gunpowder, which when taken on the point of a knife and marked on the nail, produce a fine verdigris color; whereas in the higher qualities of green sand, the particles are too fine to detatch. The former, I suppose, is what is called the "gun-powder marl."

I met lately with Professor H. D. Rogers of the Pennsylvania University, at one of the banks on this river, and he told me that this was identically the same with the New-Jersey green sand, that it appeared there in all the varieties it did here, with and without lime, but that some of the Jersey green sand was richer than any he had met with here. But the green sand of Jersey differs from ours in a geological point of view, being of the secondary formation, and therefore the shells differ from those of the deposite here, as to kind, but agree as to quality.

As I before observed, my experience with the green sand proper is limited. I had never heard of the name, much less know the value of the article, until last winter twelve months, when I met with Professor Rogers' paper on the subject in the Farmers' Register, previous to which, I had always rejected the green sand, when we came to it in working our banks: having tested it by analysis, as regards lime, and finding very little, I rejected it as altogether worthless. Since knowing its character, I have used a good deal of it; but do not think we have had time enough, yet, properly to test its merits: however, as far as we can judge, so far, its effects are flattering; indeed in some instances very remarkable. The finest celery I ever saw grow, was in trenches half filled with green sand, and no manure; it was doubly as good as the rest of the square, (which was also good) cultivated in the usual way, the trenches well manured, but without green sand or marl. I also tried it on a galled knoll, where the soil was entirely washed off. The land was lightly sprinkled with straw, a part was dressed with marl, containing a goodly portion of lime, and some green sand—good marl, but not the best quality. The other part was dressed with green sand, both at the rate of 200, or 250 bushels to the acre. Where the first was applied, the land gave some signs of vitality, (the whole piece being planted in corn.) Where the green sand was applied, there was a smart growth of corn, with pretty good ears, the other producing none. But the most decided proof of its beneficial effects, was evidenced on cotton. I selected, as I thought, the poorest spot on the farm where I reside, the spring of 1835, (being a part of one of those cattle-starving, comfort-killing appendages, called a standing pasture,) and fallowed up a few acres which I put in cotton; the whole was manured in the drill with coarse litter. On about three acres, the litter in the drill was top-dressed with green sand at about 100 bushels to the acre; but I should observe, that this green sand was of an inferior quality to that used with the celery and corn, not being from the same deposite, and being the upper, or overlying stratum of the tertiary formation, containing about thirty per cent. of green sand and five of gypsum, most of it having no lime at all. On another acre, old ashes, in about the same proportion were applied, in the same way, and the cultivation was precisely the same on these four acres, as on the rest of the patch. Where the green sand and ashes were put, I could see no difference: but between that, and where no marl or ashes were put, it was as five to one or more. Where the green sand and ashes were applied, the cotton was of fine size, and as well branched and bolled, as I ever

saw cotton, while that of the other was small and inferior, scarcely worth any thing. The green sand first spoken of, as being used with the corn and celery. I also used with cotton, upon land that had never before brought cotton, although frequently tried, being very light and sandy. It was used in the same way as the other, in the drill, with coarse litter: the crop was very fine for the year, maturing very early, and the staple good; it was decidedly the best cotton I saw last fall, and it was all open before the first frost. This piece of land, though, had been previously marled, and therefore I cannot say how much the green sand is entitled to claim for the crop. I tried the green sand also on cimlins the last year, but could see no effect; those on which none was put, being as good as where it was. They were all good, but I could ascribe nothing to the green sand.

My next experiment at home, was with turnips, both ruta baga and common white, (for here I have only been using marl since last summer.) The land was prepared as for the cotton, except that the litter was no so good, the drills four feet apart, the manure spread in time and top-dressed with green sand marl, being about equal parts of green sand and lime, say 34 or 35 parts of each, at the rate of 100 bushels to the acre; the land was then bedded on the litter, and the turnips sowed on the top of the beds.—This was ordinary land, not good for more than three to four barrels of corn to the acre; it was forgotten to leave out any rows without marling. The fall was said to be a bad one hereabouts for turnips, but the whole crop was excellent, perhaps the best I ever had. The only difficulty with them was, that the marl forwarded them rather too much for winter keep.

In September and October, I marled about 50 acres of clover fallow for wheat at the rate of 200 bushels per acre, the marl being that last spoken of, equal parts of lime and green sand. So far the wheat promises well: without additional disasters, or an increase of the strut, with which it is seriously affected, it will probably make 20 or 25 bushels per acre.

The effect, or supposed effect, of marl on this wheat, I should not have mentioned, as the land was in good heart, and had a good growth of clover on it, but for the fact of the field, (which is all light land,) having several sandy knolls in it, which had no clover on them, and which I scarcely ever saw bring wheat or corn; and I can now see but little difference between those spots and the rest of the field: *that* certainly proves something. The land was fallowed with three-horse, or rather ten inch Davis ploughs, the marl then spread, and re ploughed with smaller ploughs as shallow as possible, the wheat then sowed and dragged in both ways, so as to mix the marl as perfectly as it could be effected.

On the plantation where I commenced marling four or five years ago, all has been realized that the most sanguine could have anticipated. The open land will be nearly finished this year once going over, at about 250 bushels to the acre; and the farm now presents an entirely new face. Where three years ago there was a sparse growth of hen's grass, now is the most luxuriant clover. The first land I marled there, was a very poor piece of hen's grass indeed; the next year it came to corn, when it received a light dressing of coarse manure. The corn was good, say six or seven barrels at least; it was followed by wheat, which was also excellent, and the clover is now, I dare say, as good as any I ever saw. I find the deep blue marl, or having that appearance in the bank, containing most green sand, decidedly more beneficial than the lighter colored or gray marl, containing fully as much lime, but less green sand—as will the green sand marl generally on the river producing a much more prompt and efficient action than the white, or miocene marls of the forest, although the latter contains a much larger amount of lime, than any of the eocine, or green sand marls.—But it all repays the farmer, with compound interest, for its use.

As far as my experience goes, I find that with all marls, or rather calcareous matter, such as we call in this country marl, it is time thrown away, or worse, at least for the time being, to apply marl without vegetable matter of some sort. Stable and farm pen manure, and clover, of course are best to use with it; but I find any vegetable matter answers well in sufficient quantity. From my present experience with the use of marls, I certainly prefer the mixture of the green sand and lime, or what we call the green sand marl, to either green sand or lime alone. The green sand marls seem to exert a wonderful effect on clover, and all grasses with which I have tried it. It certainly forwards to maturity too, all crops with which I have used it; cotton, I think, two or three weeks at least. The fallow wheat to which I have referred above, is now at least ten days forwarder than any in the neighborhood of the same kind. I have found the only way to marl efficiently, was to have a detailed force, set apart from the crop, and kept constantly at it. We never stop our carts when the weather will permit hauling, except in harvest and seed time.

A good many are now beginning to turn their attention to marling in the forest, and some on the river: and in every case where it has been judiciously applied, the same good results have attended. And I see no good reason to doubt, why the fondest anticipations of the patriot and philanthropist should not be realised, as regards the tide water section of Virginia—if the people will only shake off that lethargy and inaction which it seems so easily besets them, and use the means aright with which nature has so abundantly supplied them.

My views and experience upon the transportation of marl by tide-water, as well as the utility of a railroad, intersecting the heart of the eocine district, across from Richmand to the Rappahannock, &c. &c. I must defer for another communication, if you think them worthy of notice.

I have now, sir, given you a crude synopsis of my experience with the green sand marl, and somewhat my views respecting its use. Should you be able to winnow wheat from the bulk of chaff, which you may think would add to the general fund of agricultural information, or at all interest or benefit any of your readers, it is at your service to dispose of as you may think proper—to give it to the public, or throw it aside as worthless.

C. BRAXTON.

From the New-Orleans Bee.

PHENOMENA OF RIVERS.*

In speaking of the elevation of the Mississippi river it may not be amiss to state here, some facts concerning the alarming extent to which the rivers in Europe have elevated their beds during the latter centuries. From this have arisen desolating inundations, which still swell higher and higher and become more destructive, and which must ultimately produce a total revolution in the situation of some river countries.

Yes, rivers which were formerly navigable for large ships cannot at present be navigated by the smallest craft. The high stages of water of the river Rhine in the beginning of the year 1802 and February 1808 from Strasburg to Mayence were without example. Similar inundations happened in 1808, not only in Germany but in France and Holland. In fact, the devastations which have been produced by inundations since 1784, in Germany, Italy, France, and Holland, were of such an extent, that they have destroyed the greater part of the benefits which the rivers bestow on the inhabitants of their vicinage. The stream of ice of the Rhine, Waal, and Ysel in Holland, caused in 1799 breaches in 23 dykes, covered a province of 63 square miles, destroyed many vessels and a great number of houses, and all the dykes on the Rhine from Strasburg to Holland. All these returning inundations are the undeniable proofs that the beds of rivers elevate themselves and become wider, consequently do not allow the water to flow off with the same uniform velocity as formly.

The elevation of the beds, the formation of islands, the many branches and the meanders have in most rivers increased in a very alarming manner. For instance, the mouth of the Meuse has lost its navigable waters since the beginning of the last century.—The Mercuredi has elevated its bed 20 feet during the last two centuries; and this river, like the Ysel and the Leck, is at the lowest stage of water higher than the adjoining endyked district, which are called in Holland *Polder*.

In Holland, the difference or separation of the rivers occasions an elevation of the bed and causes injurious inundations, as some branches receive too great a mass of water and others too little.

Not only in Holland, but also in France the beds of rivers continue to rise higher.—Below Rouen at Villeboeuf, where large vessels formerly navigated the Seine, are at present sand bars which scarcely allow the small river vessels a passage. The Charante has elevated its bed in such a manner that the equipped men-of-war cannot pass out from Rochefort, but are towed without equipage to the Isle of Re upon the ground.

The Loire, which formerly had a sufficient depth to Nantes, is at present hardly navigable for large vessels as far as Painboeut. The Gironde between Bourg and Negent is filled in the middle of its bed with numerous sand bars; and the river Adown is exposed in such a manner to the collection of sand that Bordeaux and Bayonne have lost much of the advantageous situation which these rivers formerly afforded them; and to Toulouse only, vessels of 10 tons can navigate.

The Rhone, which divides itself into several branches, stops up its mouth and the ports. It has filled up the port of Boire with sand.

Even in the neighborhood of Paris the devastations have been greater than formerly, in consequence of the Seine having elevated its bed so as to produce more frequent inundations.

In England the rivers also fill up with sand The Thames, Severn, Metsey, and Trent have continually increased in shoalness; while, along and across the small

*This article is evidently written by a foreigner, imperfectly acquainted with our language, but we have preferred to give it without alteration.—EDS. J. OF C.

nd middle class of rivers, canals have been constructed which have cost millions, very little has been done t wards the improvement of the rivers, and used them only as mill seats They therefore, inunda e yearly large tracts of land, and carry away the banks.

In Spain, the Guadalquiver has obtained a number of islands, bends and shallow places; and its bed has been elevated in such a manner, that sea vessels cannot go up to Seville as formerly. Several other rivers in Spain have likewise elevated their beds very considerably.

In Portugal, it is said the rivers produce more injurious effects than in Spain, because their beds have been continually filling up with sand and gravel, from want of the application of proper means here, as well as in Spain, to prevent it.

In Italy the beds of rivers elevate themselves in a horrible manner; the Estock, the Adigetto, the Tartaro, the Po with its three principal branches, the Reno and Penaro from a river and marsh chaos, which always rises higher, and covered the most beautiful fields, and still threatens to bury very large tracts of lands Between Bologna, Fenara, and the Adriatic sea as far as Acquileza and the Isonzato, this confusion of brooks, rivers, lagunes and marshes, is the most extensive. Brenta has elevated its bed during 50 years upwards of 10 feet, and inundated and covered with sand several square miles above and below Padua.

In Austria the beds of the rivers have also elevated themselves. The beds of the Danube, Merter, and March, rise always higher.

The principal rivers n Bavaria, the Inn, the Leok, the Isar, and the Danube have elevated their beds.

In Tyrol, the river Etsch has elevated its bed to such an extent, that the countries from Batzen, Salaen, &c. have become marshes, whose surface has extended itself over a large country. Former fertile fields are now marshes which produce a very unhealthy atmosphere, which has destroyed the constitutions of the people who live in several square miles.

The Swiss is not only united by the elevation of the beds of rivers but also from the rise of its seas, which is occasioned by the deposition of material brought down by the mountain streams. The Wallen sea, and the Glarenen Linth have changed the finest fields into marshes. The following quotation on the effects of the elevation of the Linth river on the surrounding country is from a Swiss paper: "To view this misfortune in its dreadful magnitude, we must for a moment consider ourselves in the situation of the miserable inhabitants. What a corroding grief to see by degrees their finest possessions become an exorable prey to the grasping hand of devastation! Order, activity, industry and frugality protect them no longer against poverty. Even in the sanctuary of their houses they find no refuge." The straits of Wallenstadt and Wissen are in the summer only useful for vessels, the inundations fill the cellars of the houses, and in some places ascend to the first floors, and from the deposited sediment the heat of summer creates epidemical vapors and noxious insects. We may easily imagine how this operates upon health.—The population has long since sunk below their former condition; in their infirm, pale, weak and spiritless forms we might suppose we saw moving shadows grieved by a sensibility of their own generation, yet now by the aspect of their children, in whom is still more visible the increasing degradation of mind and body, so that we must fear that ultimately, with the sinking of the lands, there will be a total annihilation of the human race. The malignant fevers which prevail periodically in the towns of Wallenstadt and Wessen have also extended their ravages to the large villages of Muhlhorn Mattis, Nefels, Urnen, Bilten, Shannis, and villages situated farther down the vallies towards the Zurichen sea. These injurious effects of a pernicious atmosphere have already reached the higher mountain communities, of which the community of Kerengen presents a sorrowful example. From year to year these epidemical diseases progress forward; they crop the whole Zurichen sea and produce far from the place of their origin fevers which were then formerly unknown.

This picture is more or less applicable to the Veronical marshes, the wet countries on the marsh, the poatinical marshes, the marsh district situated between the mouth of the Rhone and the Mediterranean sea, and to many large districts in Europe.

The rivers in Saxony, Poland, and Prussia, have likewise elevated their beds; the innumerable inundations have risen of late higher than formerly.

At Bremen, the Weser continues to lose its navigable water; so does the Elbe above Hamburg, although this circumstance is of great importance and danger to both of their commercial cities.

The immense empire of Russia has a number of rivers which are not navigable on account of their shallowness. Although the canals and navigable rivers in this empire are of great importance to its prosperity, yet infinitely greater would be the deepening or rendering navigable those rivers which are not so at present.

The naturalists have irrefutably proved to us, that several river countries were formerly seas, and yet we look on so unconcerned at the elevation of the beds of rivers without considering that our descendants must necessarily transfer their abodes from our present dwelling places, when the rivers have elevated their beds above the margin land and are no longer able to construct dykes of sufficient strength to resist the currents.

Several river countries will and must be changed into marshes and ultimately into seas, which they were formerly, for nature will follow its course unless it be impeded by the application of proper means.

Carion Nizzas, in a speech delivered in the Corps Legislative at Paris, 17th September, 1807, said:

"It is not alone to the revolutions of nature, or the violent combat of the elements that fields are changed into morasses. No! to effect this, more trifling causes are often sufficient. The negligence of the government, the ignorance of the administration, the common indifference of the public officers for the general prosperity, the slavish customs, the common mode of doing business, and lastly, the stubborn resistance with which men oppose that which is for their benefit. All this, we not only see in those countries where barbarism and ignorance prevail, not only in the once flourishing cities of Asia Minor, and Major and Minor Greece where the unhealthy atmosphere has produced many devastations, and altered the formerly pleasing aspects into scenes of misery and lamentation? No! these changes have taken place on the shores of our rivers and seas! Yes! in our cities, formerly celebrated on account of their healthy situation."

OX REFORM, OR A NEW WAY TO HAMPER BREACHY CATTLE.

Mr. Otis Nelson, of Minot, informed us the other day, of a very ingenious contrivance which he invented and applied to an ox which was in the constant habit of taking up fence or pushing his way through it whenever he pleased. He made a wheel of stout board of a size sufficiently large to project beyond the horns. He then placed a round rod of iron across the horns of the ox, placed the wheel on the middle of the rod and confined it in such a manner that it would turn easily on the rod but not slip toward either end of it. Near the edge of the wheel he put in a small strong staple; to this staple he attached a small but strong brass chain which went down and hooked into a ring in his nose. Thus equipped he was turned out. On applying his head to the fence the wheel was the first part to meet it; on the least motion it would turn on its axis, one way or the other, and as it turned would strain upon the chain and *tweak* his nose.

The old fellow, after trying it several times and finding his nose so unaccountably and severely pulled, concluded to give it up as a bad business, and has become so far reclaimed that the chain has been dispensed with.—Maine Farmer.

PRINTING FOR THE BLIND.—We are happy to inform our readers that the British Society for embossing and circulating the authorised version of the Bible for the use of the blind have received the munificent grant of 100*l.* from the British and Foreign Bible Society "towards printing the Scriptures for the use of the blind, by means of an embossed stenography, after the invention of Mr. Lucas." In order, therefore, that the blind may be regularly supplied with the sacred Scriptures, the type is already commenced in this city, and the Society expect to commence printing some time next month. They are, therefore, desirous that the blind should receive the instruction offered them by the Society at their school, 57 Castle-street.—[Bristol Journal.]

PATENT ROTARY PRINTING-APPARATUS.—A patent has recently been taken out by Mr. Rowland Hill for a rotary printing-machine. The types are imposed* upon cylinders, to which they are firmly attached, and of which, except the marginal spaces, they occupy the whole surface. The pressure is given by blanket-covered cylinders of the ordinary construction.

The most important advantages of this arrangement are stated to be, first, That as the revolving type cylinder is constantly receiving its ink in one part of its revolution, and constantly impressing the paper in another part, the action of the machine is unceasing; whereby a saving of time of about three parts out of four is obtained in comparison with the ordinary printing machines, when moving at the same velocity; because in those machines the backward motion of the form,* and the laying on of the ink, suspend for the time the process of printing. Further, as the motion of the type in this machine is continuous instead of reciprocating, the speed has been increased without difficulty or danger; and by this additional velocity, combined with the saving of time just described, the rate

*These words are used techincally.

of printing is brought to about ten times that of the ordinary perfecting machines, i. e. those which print the sheet on both sides before it leaves the machine. Secondly, the reciprocating motion of the heavy form, inking table, and inking rollers of the ordinary machine entails such a loss of power and time, in comparison of the rotatory motion which is here substituted for it, that it is believed, from careful observation, that, notwithstanding the great increase in speed, any given quantity of work will be executed at the expense of about one-eighth of the power required in the ordinary machine.

The facilities provided for fixing the type, detaching parts for correction, applying the ink and regulating its supply, are said to be fully equal, if not superior, to those of other machines.

Compared with the rapid machines used for printing the daily newspapers, the rotatory machine will print two sheets on *both* sides with accurate register, while they print *one* sheet on one side with defective register.

Chinese Manufactures.—The superior industry of the Chinese people, as compared with other Asiatic nations, is proved by their extensive exportation of manufactured articles. Besides the more important articles of tea and silk, the following may be added, —alum, white-lead, red-lead, brass-leaf, tutenague or zinc, false-pearls, glass-beads, paper, paper-hangings, toys, table and floor mats, and china-ware, with the precious metals. Alum is prepared in the distant province of Kiang-see, which supplies, we believe, the whole East with this mineral.—In British bottoms alone there were exported, in 1831, above a million and a half of lbs.; but it is probable the junks carry away to the various settlements connected with the empire a larger quantity. Tutenague or zinc, obtained from the mines of Yun-nan, used to be largely exported, until German spelter, a less pure but much cheaper article, was introduced about the year 1822, and has nearly superseded it.—The paper of China, supposed to be manufactured from bamboo-cane, is brittle, from the too copious use of alum, and is greatly inferior to the European fabric; but being much cheaper than this last, it is used even in our Indian settlements for all ordinary purposes. The Chinese porcelain, which was so largely exported before the western nations borrowed the art, is still an important article of commerce. It furnishes, indeed, all the inhabitants of the Eastern Islands, from Sumatra to the Phillippines, and the tribes from the western border of China to the eastern frontier of the Burman country, with the principal portion of their culinary vessels; even the Persians and Arabians make use of it, receiving their supplies by Bombay. The quantity annually bought by the British does not exceed in value eight or nine thousand pounds; but the Americans purchase to a much larger amount. It may be mentioned, that the total value of manufactured articles exported by the English and Americans in 1834, excluding from this computation raw silk, refined sugar, and silver bullion, exceeded two millions of Spanish dollars.—[Edinburgh Cabinet Library, Historical and Descriptive Account of China, Vol. 3.

Improvements and Embellishments in Paris.—The granite for the pedestal of the obelisk of Luxor has arrived, and only awaits the decrease of the waters of the Seine to be landed. It consists of seven blocks, one of which weighs 120,000 lbs.—The Hotel Dieu, it is said, will shortly be taken down, to carry on the beautiful line of quays which extend along each bank of the Seine. The sick will be removed to the Invalids, which establishment will be broken up, and formed into several branches, in various parts of the country, where articles of provision, &c. are cheap.—[Paris Advertiser.]

Busts.—A new instrument has been invented in Paris called the physionotype, for the moulding of busts, on a principle which renders the likeness to the original a mechanical certainty. Busts in plaster are thus produced for five francs each. Another machine, entitled the portrait mirror, has also been constructed, by which a portrait may be taken in twenty minutes from the reflection of the face of the original in a looking-glass.—[Athenæum.]

Berlin Iron Ornaments.—Some of these are so fine, consisting of rosettes, medallions, &c., that nearly ten thousand go to the pound. In the coarse fabrics the value of the material is increased by manufacturing eleven hundred times, and in the finer nearly ten thousand times.—[Arcana of Science, 1835.]

Interesting Discovery.—The Fredonia Censor, of the 14th inst., states that a very rich mine, yielding *Alum* in the proportion of two thirds, and *Copperas* in the proportion of one third, has been discovered in the town of Sheridan, Chaut. co., on the farm of Mr. Joseph S. Loomis. From present appearances, it seems to be very extensive, if not inexhaustible; and Mr. Loomis is making arrangements for having it worked.

Ornamental slate manufacture.—Slate of late years has become extensively useful, and its application to new purposes is of every-day occurrence. A Mr. Stirling has for some time been laboring to bring it into use as a material for the manufacture of various articles of furniture, and, from the specimens which we have seen, we think it likely that he will meet with complete success. Tables of all kinds, side boards, wash-hand stands, and other articles of a similar nature, and which do not require to be often moved (as slate is, of course, heavy), may be made of it decorated in the most elaborate style. The natural texture of the slate, it has been found, is peculiarly applicable as a ground for the reception of colors; and Mr. Stirling has some specimens of tables with a wreath of flowers round the edge, and a group in the centre, most beautifully executed—the neutral tint of the slate forming an appropriate back-ground. A very beautiful and appropriate application of the article has been made in the formation of door-panels. The General Steam Navigation Company has, we understand, given orders for the fitting up of the saloon of one of its new steam-vessels with these panels, painted with groups of fruit, flowers, and designs of a like nature. Amongst the numerous other articles of slate manufactured by Mr. Stirling, we shall merely particularise his door finger-plates and inkstands, which are extremely beautiful.—[London Mechanic's Magazine.]

Short and long screw-drivers.—Electric or minor elementary matter lessens pressure on a body, owing to the momentum of its atoms being as their size; to which may be added, the farther from the source of power, the more reduced is the effect, which is exemplified in any system of machinery depending on a single motive power, and turning an extended spindle, the motion of which keeps remote mechanism in motion. The more simple exemplification is that of that of a turn-screw and the hand. The carpenter imagines, that with equal force of hand a long turn-screw is more powerful than a shorter, because the longer turns a rusty screw, which by a shorter cannot be moved. The fact is, power is lost by the long one: resistance it is which is reduced. The longer is the lesser power. In screwing, the force is in the direction of the required effect forward; in unscrewing, it is the same to produce the contrary effect. A screw of difficult removal is much pressed in a direction the contrary of what is wanted; to make it ascend is the object—pressing it into the wood, the act. In unscrewing, the hand uses its force in two directions—forward, to keep the tool in the slit of the screw; rotary to produce the turning, and consequent ascent of the screw. Lessening the forward force on a screw is the object gained by the longer instrument; the whole of which forward force is got rid of, when the screw has a head which admits of a winch. The tool may be uselessly long; the forward force by the hand being as before, it may be insufficient to command the position of the tool in the slit, and too weak to produce any turning effect; or should the slit be deep enough, the greatest effect will be on some part of the blade of the tool in a twisting direction. The carpenter little thinks that his exertion is employed oppositely to his intention or against himself, the turning effort by one hand having to overcome the forward effort by the other.—[Pasley's Nat. Phi.]

The Count de Laplace.—A monument has been raised to this great man at Beaumont, and placed on the site of the house where he was born. It is a building erected for the purposes of a primary school, and a hall for the mayoralty. Two tablets of marble are inserted in the front of the building: on one it is recorded, that the corporation of Beaumont had erected this edifice to the memory of Laplace, who was born at Beaumont, the 22d of March, 1749; and died at Paris, the 5th of March, 1827.—On the other is inscribed the following:—

"Sous un modeste toit, ici naquit Laplace,
Lui qui sut de Newton agrandir le compas;
Et, s'ouvrant un sillon dans les champs de l'espace,
Y fit encore un nouveau pas."—[Athenæum.]

Railroad to India.—Long before ten years more, I trust to see a regular communication, in 45 days, between England and India, in every month of the year, established on a permanent and well organised footing. That the communication can be accomplished in 45 days is beyond a doubt, even allowing nine days for the several

necessary stoppages.—[Mr. Waghorn, in a letter dated Alexandria, April 7, published in the Morning Chronicle of May 11.]

From the Journal of the Am. Institute, for August.

REPORT FROM THE HON. HENRY L. ELLSWORTH TO THE SECRETARY OF STATE, AND TRANSMITTED TO THE SELECT COMMITTEE ON THE PATENT LAWS.

PATENT OFFICE, 1836.

SIR: I have the honor to acknowledge the receipt of the inquiries made by the honorable chairman of the committee on the patent office, in the house of representatives, and referred by the honorable Secretary of State to this office for my report in part. As the answer must in some measure depend upon the organization of the office, I will respectfully reply, first, to the following inquiry, viz: "what alteration or improvement of the law, relating to the granting of patents, has experience shown to be requisite to effect all the objects which it is desirable to obtain in this department?" A brief reference to the history of the patent law, and the practice under it, will be necessary to learn the "mischief," and provide the "remedy."

It is nearly half a century since the present patent law was enacted. Previously to 1793, all petitions for patents were presented to the Secretary of State, Secretary of War, and Attorney General, who examined them, and granted or refused a patent at their discretion. This duty having been found an arduous one, and also a great interruption to other business, the law of 1790 was repealed, and the present act passed, which is more in conformity with the practice in Great Britain.—Few alterations have been made in the existing law since 1793, if we except the extension of a privilege to a certain class of foreigners. While a laudable spirit prompted our legislators to encourage the arts, the poverty and distresses of the country forbade the passage of any law for the protection of inventors which might increase the burdens of the community. Such a tariff of fees was accordingly established as to defray, as far as possible, the expenses incurred by government in giving patents. Hence it is not strange, that glaring imperfections now appear in the law. It has been a matter of astonishment that so important a branch of domestic polity should have been so long neglected. The time has now arrived when the amount of revenue derived from this source, the magnitude of the claims dependant upon the patent law, the great delay and embarrassment experienced by patentees at the office, all conspire to demand a thorough survey of its present organization. To insure attention to this subject, it need only be mentioned that the number of patents issued annually, for a long time, did not exceed one hundred, whereas, at present the number is about eight hundred, and will soon increase to one thousand. Such is the desire to secure patents, that individuals have taken out more than fifty patents. The amount of fees for patents annually ($30 being the fee) is about $25,000 The present year it may exceed $30,000 To this amount fees for copies and recording are to be added, making the sum larger still; and notwithstanding the rapid increase in the business of the office within a few years, very little additional force has been allowed for its accomplishment. Patentees complain of delay, and very justly, but this delay must soon be greater than at present, without the interference of congress. It may be asked if such are the profits, why not apply the funds received to the discharge of accruing business?—The answer is readily given. All the money received is, by law, paid over into the treasury, and although to be credited to "the account of clerk hire," cannot be appropriated to this use without a special act of congress. The superintendent has requested additional assistance, but the honorable Secretary, although anxious to afford every facility, has not felt authorised to increase the expenditures on his own responsibility. Patentees and suitors in courts have suffered much during the last year from delays in the office; cases are sometimes continued for the want of copies, which would readily be furnished at one half the lawful fees now charged if the superintendent was permitted to get the work done. A few facts need only be added, to show the propriety and importance of a revision of the patent law. The whole expenses of the patent office do not exceed one-fourth of its income. The number of applications for patents since the 10th of July (at which time my superintendency commenced) has been upwards of six hundred. The correspondence has trebled within a few years. No less than two thousand letters have been written by the superintendent since July last. More than one hundred suits are now pending in the United States courts touching rights of patentees. These suits will increase until some check is put to the fraud now openly practised, but irremediable without the aid of congress.

Questions are frequently asked at the patent office, which require several days search to answer. Each patentee (if he is honest) wishes to know whether his patent will infringe upon others. This is apparently a simple inquiry, but only a reference to seven thousand patents can settle the question. And here, what an embarrassment must arise from the want of systematic arrangement of the papers. Previous to July last, not a single letter received was filed, and even now none are indexed. Many volumes of records are also wholly unindexed, and must remain so until more help is provided. And was not an hourly reference to these volumes and correspondence necessary, the unsystematic arrangement of papers would be less tedious and perplexing.

The injustice and inexpediency of the present law, will appear in reference to the charges made for services performed at the office, besides the fee of thirty dollars By the law of 1793, each copy of one hundred words is charged at twenty cents certainly twice as much as it costs to make the copy, if labor is computed at one thousand dollars or twelve hundred dollars per year for a clerk. It may be mentioned, as a singular fact, that copies of the papers in the State department, are charged only ten cents per one hundred words Each drawing whatever its size or complexity, is charged at two dollars. A few drawings are worth less than this sum, but most of them twice as much, and some are worth forty or fifty dollars. A fair remuneration ought to be charged to each applicant.—There are now applications pending for drawings, where the draughtsmen will be compelled to labor several days, at a salary of three dollars and thirty-three cents per day, and earn for the government but two dollars for the whole time.

So sensible are the patentees that the price is much less than the usual charge for the same thing out of the office, that they frequently apply to the superintendent to get the original drawings executed in the office at two dollars. This request is always refused, for patentees are bound to furnish original drawings, and the patent office is only required to give copies of drawings of patents granted.

The delay of patents has been alluded to. This is one of the greatest evils. Applicants are always impatient; some travel to this place from a long distance, and are anxious to carry their patents home with them; other patentees are urgent for papers to be used in courts; especially where old patents are adjudged invalid, and the right of action is suspended until a new patent is obtained; nor will an additional number of Clerks produce the desired relief, without some alteration of the present requisites. According to the existing law, the patent must be signed by the *President*, the *Secretary of State*, and the *Attorney General*.

The Attorney General has the right to retain the patent fifteen days for examination. It must be apparent to all conversant with public business, that there will be delay in the signatures of such high functionaries, since their time is demanded for more imperious duties. How much greater must this delay be, when the person whose signature is wanted, is absent from the seat of government; nearly one half of the patents issued since July have been transmitted more than two hundred miles for single signatures. It may be asked, how is this difficulty to be remedied? it is believed that two of the three signatures can be dispensed with; can it be necessary or useful to have the whole number?

The rights of the patentee are the same with the signature of the Secretary of State, as with the addition of the President and Gttorney General. The great seal can accompany the Secretary's signature, and the patent be issued in the name of the United States. It is true the Attorney General is bound to examine the patent; but is this necessary? Among all the patents transmitted since July, only one has been returned as imperfect, and in this case the defect was not fatal to the validity of the patent. The best examination can certainly be made at the patent office, where the drawings and models are deposited. If the signature of the president and Attorney General could be dispensed with, considerable labor and much interruption would be avoided. If additional help was

given to examine the patent and the signatures of the Secretary of State, and the head of the bureau, only required, it is believed that a patent might be issued in a few days, whereas now the average time is two or three months.

The present arrangements are not economical. Congress appropriated, a few years since, $14,000 to bring up the records of the office by employing clerks at a compensation not exceeding twelve and a half cents for every hundred words. A small part of this appropriation remains unexpended, and a temporary clerk is employed under the act. The employment of temporary clerks is objectionable: unskilled, they are liable to commit errors; besides, the compensation of twelve and a half cents per hundred words is much higher than the salary of a clerk at $1,000 or $1,200. It is due to those who labor in the patent office to state, that services required and performed there are not exceeded in any of the bureaux of government. Great caution, much skill, and some legal science, are requisite in issuing every patent.

Notwithstanding the superintendency is in form a separate bureau, (yet in law a clerkship,) and the superintendent charged with the whole responsibility of issuing the patents, disbursing the special appropriation of $14,000, and the contingent fund of $2,000, accountable for all the fees received in the office, and personally required to conduct the correspondence, still his compensation is lower than that of chief clerk in either bureaux of auditor or commissioner. If the patent office was placed upon the same footing with the land office or Indian bureau, the compensation allowed would secure competent assistance. And it is desirable that those who are in the office should receive a fair remuanration as an inducement to remain after they have become acquainted with its minute details. The salaries in the patent office, as compared with those of the land office, Indian bureau, or either auditor's office, will be found from thirty-three to fifty per cent. less. Hence there is in the patent office a constant desire to change situations, and this comparatively low compensation will prevent able and permanent assistance.—Will a clerk remain satisfied to labor for $1,000 in the patent office, when the same clerical services in adjoining offices bring $1,250 to $1,500. The aggregate pay of superintendent, three clerks, machinist, and messenger, in the patent office, amounts to $5,400, whereas the pay of the commissioner of Indian affairs, four clerks, and a messenger, is $8,700. One third of the revenue received from patents would defray all the disbursements for salaries, and leave two thirds to be appropriated as congress might direct.

I have alluded to frauds under the patent law. These frauds are daily practised by persons who take out patents without making any new discovery or improvement.—The law gives neither the superintendent nor others any judicial powers. Every applicant has a right to demand a patent i. his papers are in order; and several patents are often issued for the same thing. Congress seemed to have noticed the impropriety of granting two patents for the same thing by giving the Secretary power, in case of two pending interfering applications, to order them both to arbitration to decide upon the right of patent, but under the rules established to direct the office no applications are deemed interfering unless the papers of both are complete in all respects.—Should two applications be precisely alike, and one of them need only a trifling requisite, such as an additional witness, it then would be no interference; and as there is seldom a case when the papers of both are in the same state of forwardness, an arbitration under the law is a rare occurrence.

The oath of inventors has been too often justly compared to the "custom-house oaths." There are, however, inventions made by persons living in different parts of our country, when both can claim originality; for no sooner are the wants of the public known than men of ingenuity attempt to supply them. The late burning of baggage on railroad cars produced immediately many inventions to remedy the evil, and several interfering applications were made. The issuing of patents to those who have no claim to originality is truly a great evil. Every facility is now extended to pirates. Even copies of models are taken by visiters at the model rooms, and patents demanded of a similar kind. During the last week a patentee was explicitly told that his patent, if granted, would be a direct infringement upon previous patents: "but a patent must be had;" it was demanded, and accordingly ordered to issue. It is believed that several hundred thousand dollars are paid annually in the United States for patents improperly obtained.

The success of past villany has emboldened many to continue their deception upon the credulous. The public attach high reverence to the great seal which the patentee is careful to exhibit. Fraudulent patentees are shielded in some measure by the expense of litigation, and many, very many, pay commutation, and submit to imposition, rather than be dragged into courts of justice. How easily, for instance, can an individual take out a patent resembling one granted to a citizen of Maine, and sell the same in the south-west part of the republic! An arrest of the infringer might be uncertain, and indemnification still more doubtful. The pirate, after selling out his rights to States, counties and towns, might easily pass over the borders of our territories and be safe. There are a great number of cases arising out of the patent law before the United States courts. How much will the number be increased when the eight hundred patents granted this year shall appear with their many interfering specifications? There will be a rich harvest for the lawyers; but how many honest mechanics and inventors will be ruined by the expense of litigation. Is there no remedy?

The remark of Mr. Jefferson, who, while Secretary of State, was one of the board of examiners of patents, is worthy of observation. In his letter to Mr. Cooper, on this subject, he writes, "instead of refusing a patent in the first instance, as the board was authorised to do, the patent now issues, of course, subject to be declared void on such principles as should be established by courts of law. The business, however, is but little analogous to their course of reading, since we might in vain turn over all the lubberly volumes of the law, to find a single ray which would light the path of the mechanic, or mathematician. It is more within the information of a board of academical professors, and a previous refusal of a patent would better guard our citizens against harassments by lawsuits. But England had given it to her judges, and the usual predominancy of her examples carried it to ours." I would respectfully suggest the following remedy: To vest in the head of the patent bureau, or some other tribunal, a discretion to arrest a pending application for a patent, if it interferes with any prior patent, or caveat on file, and also if the application is destitute of novelty.

If scientific men could be induced to take an office in the patent bureau, as examiners of patents, their examinations, aided by a suitable library, would detect almost every interference or want of novelty. Nor is it to be believed there will be any objection to appropriate the sum necessary to obtain a good library.

To show the importance of possessing the foreign works of art, on the subject of patents, I would remark, that in looking accidentally at a German work, a discovery was there found, delineated in a drawing, which has been patented in this country, and which is now selling as a new invention. A complete collection of prints and books, in reference to the patent law, would be highly useful to patentees, and citizens in general, as well as the courts of justice. Caveats in the United States, though frequently entered, give no protection to the inventor. The existence of the caveat can be attested as evidence of certain knowledge at the date of the same, but proof furnished from the patent office gives no additional weight to the testimony. In England a caveat protects the inventor from interference for a certain period, during which time, if any interfering application is made, the person who entered the caveat is notified. An exparte hearing is had before the Attorney or Solicitor General, who decides upon the case; if there is an interference, one of the applications is rejected.

I ought, however, to remark, that such in England is the danger of giving publicity to inventions before signing the patent, that caveats are kept secret. Indeed, so great is the anxiety to conceal from the public the discovery, that the letter of the invention is sometimes only lodged for a caveat, as for instance: "New improvements on steam engines," "spinning cotton," "navigating vessels," &c. Great importance is attached to the novelty of the invention; hence, when artists in the employment of an inventor have mentioned to a stranger the discovery, and that stranger has by dexterity set up a model of the same, even after application for a patent, and before signing it, the patent has been lost for want of novelty. Our courts have adopted a

more liberal policy, and very justly decided that public experiments to test the value of the invention, do not destroy the right on the ground of publicity.

In conformity with the established decisions of this country, a caveat, if recognised by law, could be safely lodged on file, describing (as fully as possible) the whole invention, to protect the inventor against interfering applications. Our law also makes novelty a requisite for a good patent. Many have supposed the example of England and other foreign governments worthy of imitation by us. Patents in England are not confined to new discoveries there, but granted upon importation, or introduction of discoveries from abroad, and this is done upon the principle, that the arts will be benefitted by the encouragement afforded. On this point much might be said. When this system was adopted in England, communication with other countries was comparatively limited, and the improvements in the arts correspondingly low. But at the present time, such are the facilities of intercouse, and such the reading spirit of the people of the United States, that it is evidently better to confine patents here to new discoveries.

Scientific journals bring speedily to our shores every invention from abroad, and these inventions are introduced into immediate use, with barely the cost of manufacture. Who except the patentee would be benefitted by the issue of a patent for a foreign invention? thereby increasing the price at least thirty-three or fifty per cent. There would seem no occasion for offering further bounty to patentees. During the last sixty days, more than two hundred applications have been made for patents, a number greater than the average number issued annually in England for the last ten years.

I cannot omit noticing one thing more, viz: in the failure of the patentee to sustain his patent, if he claims more than is original, or presents a defective description. The description of the whole object, however limited the improvement, is a common error. The patentee knowing fully the extent of his own discovery, or improvement, ought certainly to specify the same with perspicuity. Cases will arise, however, where (in a large machine for instance) some small part described might not be new. Here a trifling error destroys the patent. While there is no sympathy for fraudulent patentees, who attempt to deceive the public by patented discoveries, there is some feeling for an honest mechanic, who, having published his patent, and believing it to be correct, is not only deprived of recovering any damages of the infringer, but obliged to pay cost to a defendant, who has enriched himself by the discovery of the plaintiff. In England an effort is making to prevent a total failure of action for partial defects, by authorising certain disclaimers to be put in a subsequent procedure to judgment. The principle upon which surrendry of invalid patents is permitted in this country, is an expeditious mode of correcting errors arising from "mistake," or "inadvertence." And if a discretion was allowed to the court, to tax or withhold costs in favor of the defendant, our practice would be more simple than the complex pleading which disclaimers must introduce. Such is the temptation to patent in this country, that it might be well to compel each patentee to publish his specification, or at least his specific claim.

We can scarcely eat, drink, sleep or work, without using some patent. Take for instance the farmer; he dares not use a plough without paying for the patent right, when, perhaps, the only new thing claimed in the specification of the patentee who offers this fine plough, is a simple *bolt*.—While cupidity induces patentees to connect their improvements with inventions of others, ostensibly claiming all as their own, it is certainly proper that the government should annex some penalty to such imposition. A judgment against the validity of the patent, is a suitable penalty. Should it appear objectionable to confer the power of arresting interfering applications on the head of the patent bureau,&c.,the objection may perhaps be lessened, by referring the interference to three indifferent arbitrators, skilled in the art in question, and as the arbitrators might make an improper award, an appeal could be allowed to the Secretary of State, or other tribunal. The present mode of appointing arbitrators in interfering applications, is to allow each party to choose one, and the Secretary of State the third. This makes a court of strong bias, as each applicant generally selects a particular friend. I ought to add that, at present, there is no compensation allowed or paid to arbitrators. Each appelant might be required to pay a reasonable fee, to be fixed by law. Interferences will generally be found to arise from ignorance or fraudulent intent. Information will correct the former, while a rigid scrutiny will induce impostors to withdraw their pretensions. It should be recollected that the first applicant is not always the original inventor; those who pirate upon inventions are generally dexterous in securing their patents as soon as possible. In such case, where the honest inventor has not been guilty of gross neglect, equivalent to a legal abandonment of his right, the superintendent might allow the patent to issue, and the rights of parties would be settled in a court of justice; these cases will, however, be of rare occurrence. Should the above remedy not be thought expedient, an entry on the patent issued that it was deemed an infringement, or was destitute of novelty, would, it is believed, go far to check improper issues, and caution the public against imposition. It has been supposed if a small part of the money received from patents was appropriated for the publication of all specifications of patents, or at least the claims under the specification, and the distribution of the same in different States, the money would be well spent. The public would then know what patents were issued, and be able to guard against spurious ones. Copies could also be easily procured without sending to the patent office, and the publication might be made with so much care as to justify the introduction of the published copies as prima facia evidence in courts of justice.

There is a common error in the assignment of patents; partial assignments for States, counties or towns, are not recognised by law; and still such a large amount of property is now held, in this manner, that it deserves consideration whether some provision should not be introduced to remedy the evil in future, and to protect past assignments. Few patentees seem to understand the law of assignment; the present law authorizes an assignment of the whole patent, or any individual part of the same, as one-half, one-third, one-fourth, &c. But the assignee must stand in the place of the original inventor, both as to right and responsibility. In the United States courts, where a plaintiff averred himself the assignee of the original inventor, with the exception of three counties in one State, a non-suit was ordered, because the plaintiff, by his own shewing, proved himself not to hold any legal right under the assignment. It is respectfully suggested, whether the time allowed for recording patants should not be limited. The same reasons for a limitation applies to transfers of patents as to transfers of real estate. It has been before remarked that the fee of thirty dollars is paid into the treasury. It often happens that this is the first step taken by the patentees. A farther examination satisfies the applicant that his patent could not be sustained, and he, of course, seeks to recover his money.—This, however, having passed into the treasury, cannot be paid without an application to congress; the sum is a small one; too much to lose, and yet hardly worth the trouble and expense of recovery.

Applicants often forward the thirty dollars directly to the superintendent, supposing that he is authorized to receive the money. As he is not permitted to do this, it becomes necessary for him to return the money, however distant, for the applicant himself to pay into the treasury. It is suggested whether the head of the patent bureau could not, (by giving bonds, if required,) receive and pay over this money directly into the treasury, and save the hazard and delay of remitting it to the patentee; and it is also suggested, whether there would be any danger in authorizing the treasury to repay such patent fees as should have been received into the treasury through mistake or ignorance, upon a petition approved by the superintendent of the patent office. In answer to the inquiry, what additional room is needed for the patent office, I would observe, that the building in which the patent office is now kept, was finished for the joint use of the post office and patent office. It is evidently too small for both. The post office department needs the whole building, while the rooms allowed to the patent office are entirely too small; the model rooms are full; several hundred models are stored away in the garret.—Those now received are piled up, waiting for better accommodations, and what shall be done with the thousand models to be received annually? While it becomes necessary to procure more room for the patent

office, it is desirable that some should be rendered as secure as possible from fire. The destruction of the present models and records would produce very great embarrassment, especially as so many original patents and assignments are lost. It is a satisfaction to state that the patent office has not been, and need not be, onerous to the government. There now remains in the treasury about $150,000 to the credit of the patent office, after paying all expenses since its first organization. A part of this sum would furnish a commodious and permanent building: and should all the patents be so arranged, in systematic order, to show the progress of the arts in the country, it would be an exhibition highly gratifying, as well as instructive. The present limited room prevents such an arrangement. In answer to inquiry, what additional expense would be incurred by an exhibition of the models of machinery, and specimens of fabrics and other manufactures and works of art not patented? I reply, that the keeper of the models in the patent office could superintend this exhibition without any extra charge, and when rooms were constructing for patented models, additional rooms could be made for the reception of fabrics and models unpatented, with little expense.

It is believed that there are many inventors who would delight to exhibit their improvements in machinery and manufactures, if room was allowed them, while they do not desire to take out a patent; such a collection and exhibition would be a repository of national ingenuity, and might be made highly honorable to the country. Who could fail to be instructed by such an exhibition? And who that was about to invest in machinery, would not be amply compensated by visiting the patent office. The exclusion of foreigners from the benefits of the patent law cannot fail to be noticed as an exception to that reciprocity which this government has ever cherished. Citizens of the United States are daily taking out patents in France and England, and the subjects of those countries are greatly disappointed in being refused a similar privilege here. Congress has sanctioned the principle of granting patents to foreigners who apply to that body. Should foreigners be permitted to take out patents, and pay fees corresponding to those demanded of our citizens in their countries, it would not be inequitable. The following table will show the comparative charges in several countries for patents:

In Great Britain, or England, and colonies	122£		$542	21
Scotland	19		84	16
Spain	60	16s.	299	97
Ireland	137		607	77
France	46	10	206	66
Austria	43	06	196	68
United States of America	6	10	30	00

It would be desirable that all foreigners should be allowed to take out patents for a fixed sum, (perhaps one hundred dollars,) since it would be difficult in some cases to ascertain what the particular country to which the patentee might belong charged for the same. By the present law, foreigners residing here two years are allowed to take out patents on the same terms as citizens. There is an evident propriety in granting patents to those who declare their intention of becoming citizens. Why visiters for two years should enjoy any privileges over other foreigners does not readily appear. I now proceed to answer more definitely the remaining inquiry. How many persons are necessary for the prompt and efficient performance of all the duties connected with the office, and what should be the respective and particular duties.—Under the present organization two additional clerks are absolutely necessary.—This would give the following force: one superintendent, three clerks, one examiner, one draughtsman, one machinist, one messenger.

The duties might be distributed as follows:

The superintendent to conduct the correspondence; issue the papers for patents; and exercise a general supervision. Chief clerk to keep the accounts; compare records and transfers; index caveats; file the applications for patents, and transmit the same; and aid, if required, in the correspondence. Second clerk to transcribe on parchment the specifications. Third clerk to aid in transcribing specifications; and filling up patents, and recording the same; and recording letters. An examiner, who should compare, critically, every specification, drawing and model; ascertain its interference with pending applications. The duty will be very arduous, some specifications containing ten or twelve pages of closely written matter, with many references to drawings. In this duty the examiner might be assisted by a scientific draughtsman, whose labor in drawing could only occupy part of his time. A machinist is necessary to repair the models and keep them in order; to classify and arrange them; to exhibit them to strangers; and to answer the many inquiries made respecting them by patentees and visiters.—The models are of much value, and the large rooms should have at least one person in attendance to protect the property. A few models have already been injured by visiters. What effect the new organization might have in reducing the number of patents cannot be determined. Some present duties would doubtless be lessened by the proposed alterations; others would arise; applications would require a very strict scrutiny to detect interferences with prior patents, or a want of novelty. To avoid the embarrassment from the delay in furnishing copies where the pay is specific, it is most respectfully submitted, whether it would not be advisable to authorize the head of the patent bureau to emply (if necessary) occasional assistance in transcribing said copies, reimbursing the whole expense from the fees received. This discretionary power would dispense with the appointment of another permanent clerk, and meet the sudden exigencies as they arise, without suspending the ordinary business of the office. I have omitted to mention that a few hundred dollars will be required to procure suitable tools for the machinist to repair the models.

I am, most respectfully, yours,

HENRY L. ELLSWORTH.

Hon. SECRETARY OF STATE.

MINERAL MANURES.

Application of Marl

Many farmers either lay marl upon land sown with tares, thus making a bastard fallow; or they apply it to grass land, or to a clover ley, to be broken up in the following year. The latter is certainly the preferable, as well as the most general practice, for it not alone produces an abundance o good pasture, but affords time for the season to operate in bringing the marl into a fit state for future tillage crops, which cannot be done in the common course of cropping, because it becomes buried by the plough before it is properly mixed with the soil, especially if turned in deep the first earth. It should, therefore, be allowed sufficient time to sink, and eat itself into the surface, before it is ploughed up. This, however, is by some persons carried to an absurd length, as they occasionally spread a coat of marl upon the green sward, and leave it there unploughed for many years, in which case the grass receives considerable detriment, for the marl then sinks downwards in a body, without incorporating with the soil; though, when it has lain a long time in this state, the subsequent crops of corn have been found to be enormous.* If laid upon grass, it may be carried out during all periods of the year in which the crop is not in a forward state of growth; but if applied to arable land intended for immediate cultivation, the months of June and July, or soon after the autumn seed-time, are considered the best for its application. If laid on a short time previous to winter, its effect is also generally prompt, because, except it be of a very tenacious kind, the action of the cold and rain commonly divide it in time, to be thoroughly amalgamated with the soil by the tillage of a summer fallow. If, however, it be only applied during the spring months, this cannot be so properly carried into execution, for it requires the winter's rain and frost to crumble it, and it consequently has but little power upon the year's crop. A complete summer fallow is, undoubtedly, the best mode of bringing it into perfect operation: but not only is the expense often objected to, but there is also a strong prejudice entertained by many persons against fallowing—into which it is not our present object to inquire, although we necessarily shall have occasion to notice it hereafter.

It is almost superfluous to add, that, in whatever manner it be applied, it must be equally spread over the land; and if there should be any larger lumps remaining, these should be broken with mallets, or clotting-beetles, in the same manner as chalk, before it is ploughed in. This, however, is not usually done until the marl has partaken of both one summer's sun and one winter's frost; and should the previous season have proved unfavorable to the reduc-

* Dickson's Original Report of Lancashire, Stevenson's edit., p. 490.

tion of marl to small particles, the process, in some cases, costs so much, that, when laid upon grass or clover, it is often found more advisable to leave the ground unbroken during another year. Then, when well crumbled, dry weather should be chosen for rolling and harrowing it—a first time with heavy rollers and drags, and a second, after it has been exposed to rain, and has been again dried: in short, until it has been rendered as small as possible; after which it should be lightly ploughed in, again harrowed, and receive from two to four ploughings, according to the condition of the soil. The intermixture of the marl with the earth cannot, in fact, be too complete; for whatever proportion remains uncombined with the soil, will not alone fail of producing the intended effect, but will have one of an opposite and prejudicial tendency.

The quantity of marl which it may be prudent to apply to the land depends entirely on the nature of the soil, and the prpoerties of the marl: the more calcareous is the latter, the greater is the effect which it will produce, as a stimulant; and shell marl possesses, besides, the additional power of nourishing the soil by the vegetable and animal mould with which it is combined. This species was formerly profusely used on every sort of ground, but at present the average amount applied to land of the medium kind is from 30 to 40, or if it be very light, only 25 cartloads, of 16 cubic feet per acre. Land of the latter quality may, indeed, be readil y overmarled; as by repeated marling, in large quantities, the surface of poor ground may be rendered so loose that, in some cases, it has not afforded a sufficient hold to the roots of corn and grass.* Double the quantity may, however, be laid upon strong cohesive soils, for it is not so easy to give them too large a dose; but if cold, wet, or moorish, great circumspection is requisite in the application of this marl, for if the land be not previously well drained, it will only increase its tenacity.

The earthy marls, if much mixed with clay, are only fit for light soils,; and, if then applied to them, the quantity must be increased in proportion to the deficiency of calcareous matter. When of good quality, containing about 20 to 25 per cent. of calcareous or chalky substance, they are commonly laid upon such land to the thickness of an inch; which will require 135 cubic yards, or about 200 single-horse cartloads per acre.† Sandy marl, though generally more calcareous; yet being dug up with less labor, is often used upon clays with greater freedom; and we have already seen the great extent to which stony marl is sometimes applied.‡ In many parts, however; where the effects of marl have been extensively experienced, these quantities have been diminished one-half, with nearly, if not entirely, the same immediate effect upon the crops, though its power has been less durable, and has in most cases altogether ceased at the end of at most a dozen years; but, then, it admits of the following advantages—a farmer may be able to afford half the expense, when the whole amount may be beyond his means; or, at the same time, he can marl double the extent of land, and he can reap all the probable benefit within the term of a moderate lease. Nor is this all; for, supposing him to have the freehold—it has been found, that when large quantities of marl have been laid upon the land, though its effects last longer, yet, unless cultivation be carried on with great intelligence and care, these are at length worn out, and by severe cropping to repay the expense, large tracts of marled land have been much exhausted. In such cases, too, a second application has been attended with very little benefit; whereas, when it has been laid on in moderate quantities, a second and further applications have been successful; the reason of which evidently is, that, in the first instance, the fertility of the mould was either exhausted by the chemical effect of the marl, or that, the soil being of a heavy kind, and the marl containing too great a proportion of clay, this addition became injurious; while in the second, dung had been applied in aid of the marl, or, its earthy properties being of a nature opposed to those of the soil, assisted in its amelioration. The latter of which supposition is, indeed, supported by the fact, that when a second application of clay-marl has failed, lime has been laid upon the same land with sensibly good effects.*

It has also been observed, in those places where marl is applied to the land in small quantities at stated distances of time, and where a sufficiency of dung is likewise used, that when weeds of any peculiar species push forward with extraordinary vigor, marl, if accompanied by a clean fallow, not only destroys them, but produces better corn than when dung has been laid on alone, though also upon a fallow, and instead of marl; which has been thought to be accounted for by the exuberance of the weeds proving that the soil is already abundantly furnished with nutritive matter for the promotion of vegetation, but that it is more appropriate to the production of the weed with which the ground is covered, than to cereal crops: whence it has been inferred, that the chemical action of the marl probably changes the nature of the mould.†

The *durability of the effects of marl* necessarily depends upon its power over the soil. A very large dose of argilaceous, or clayey marl, ameliorates sandy soils to such a sensible degree by the consistence which it affords to the land, that, if proper attention be paid to its complete combination with the surface, and to the prevention, by careful culture, of its sinking to the sub-soil, as well as to the employment of putrescent manure, the improvement thus effected will be found permanent.—When laid on in smaller quantities, its effect and duration will, on those light soils, of course, be proportionate; but on clays, as its chief power consists in the calcareous matter which it contatns, its greatest effect is apparent when the land is brought into the second course of tillage, after which it gradually begins to decline, and after six or eight crops have been grown, it usually ceases to operate. No rule can therefore be laid down for its value among tenants, upon a change in the occupation of the land, and it can only be estimated by the opinion generally prevalent throughout those parts of the country where it is used.

It is extensively employed throughout Cheshire, Lancashire, Shropshire, Staffordshire, and most of the midland counties, in almost every part of which it is found, but in the greatest abundance where the prevailing soil is a clay, or a clayey loam. It is there generally red, dark brown, or bluish-gray, intersected with veins of light yellow, of a greasy touch when moist, and friable when dry; the land where the species of marl forms the subsoil is likewise very commonly found to be of first-rate quality. There is also an excellent kind of marl sometimes met with, which is vulgarly called *dove-dung*, from resembling that of pigeons. Under sandy or mixed soils it is also very frequently met with, but usually at a more considerable depth. It is sometimes laid on the green sward in winter; and after being acted upon by the frost, is ploughed in the following spring, usually for oats. If, however, allowed to lie for twelve or eighteen months, it will have a still better effect; for the successive changes of the atmosphere moulder it down, and the roots of the grass combine it with the surface of the ground, by which means it becomes more beneficial to the following crop than if stirred immediately by the tillage of a fallow.* Marling on fallows is, however, practised to a very considersble extent, and is there found generally productive of great benefit to the soil. It is spread, immediately after being carted, upon the land, but its pulverization is left almost entirely to the atmosphere. Some kinds are much more easily reducible to a powdery state than others, and the difference determines, in many instances, the propriety of their respective application. On the stiff clay lands, or where immediate crops are the direct object of marling, those marls which pulverize with the greatest rapidity on exposure to the weather contain the largest portion of calcareous matter, and are, therefore, found the most beneficial. On light

* Perth Report; and Appendix to that of Cheshire, No. 3.

† Clay-marl is not uncommonly laid upon light soils to the extent of two roods, each containing 64 cubic yards; but on heavy land, half that quantity per acre is considered a good covering.—Cheshire Report, p. 222.

‡ See p. 303. Throughout many parts of Scotland it is applied at the rate of 200 to 300 small cart-loads per Scotch acre,—equal to 160 to 240 per imperial acre. It is there commonly applied to grass land, and allowed to remain one or more winters on the surface, until completely reduced by the frost.—Survey of Morayshire, pp. 21-320; Forfarshire, p. 407.

* Berwickshire Report. Naismith on Manures. Gen. Report of Scotland; App. vol. ii. p. 75.

† Thaer., Principes Raisonnes d'Agriculture, 2de ed. tom xi p. 415.

* Arthur Young's Essay on Manures, in the Papers of the Bath and West of England Society, vol. i. p. 106.

sandy soil, or where marl is employed with a view of producing durable effects, the more tenacious kinds may also be used with even greater advantage. Under the latter mode of application, the effects produced on the soil are not, indeed, evident until after repeated ploughings, and they frequently continue to manifest themselves during a long period.*

There is, however, a bad sort of red clay-marl, as well as a kind of brown shining clay, sometimes mistaken by farmers for marl. which, having been dug out of almost every field, and laid during many ages on some heavy soils, has increased their tenacity, and rendered them less fit for the purposes of agriculture. Its effects are, indeed, so apparently unfavorable, that its further use has been prohibited to the tenantry on the estates of the Duke of Sutherland, in Staffordshire and Salop, and a distinct line in the appearance of the crops now points out with precision the land which was formerly so treated. Of this fact all the intelligent part of the tenantry are themselves convinced, though some are still so wedded to their old customs, that they lament the regulation which excludes its use.†

Marl is, also, generally used in Norfolk, in which county it is found of better quality, and of easier access, than in most other parts of the kingdom. By Mr. Blaikie. it is described as having a hard, dry, and slaty appearance, and when first dug from the pit, and possessing about the same proportion of lime as the Norfolk clay, which contains a large proportion of calcareous earth; the only difference between them seeming to consist in the one being a little more friable than the other; so that they are very commonly confounded,—"one practical man calling that sabstance clay, which another, equally conversant in such matters, terms marl‡." By other persons, onother species is mentioned as a white, pure, calcareous substance like chalk, though sometimes streaked with yellow, but fat and unctuous. When found of any other color, it is, indeed, said that farmers can scarcely be persuaded that it is marl; but although this kind possesses greater purity than the former, yet there are many other sorts of very strong quality. On its first discovery it was seldom laid upon the land at a less rate than from 80 to 100 loads, each containing as much as a wagon with three horses could draw, and its effects were found to last, on some soils, full twenty years. This system has, however, been latterly corrected, and the quantity now laid upon the land does not usually exceed 40 to 50 tons per acre. It imparts tenacity to the soil, and where that is composed of a mixture of sand and loam, or of sand and gravel, it causes great improvement; but on land of so loose a texture as to consist almost wholly of sand, it has been found, in the course of years, to form a retentive sub-soil, which have proved injurious. It has, indeed, been shown, in some instances, that on land of the latter description, clay has had a better effect.

(Concluded in our next.)

* Holland's Survey of Cheshire p. 233.

† Loch's Account of the Improvements on the Estates of the Marquis of Stafford (now Duke Sutherland,) p. 190.

‡ Treatise on Mildew, 2d edit. p. 26. "The substance called clay, in many other districts, contains a larger proportion of alumen, or clay proper, with a very limited quantity of lime, and it, consequently, not adapted for husbandry purposes; at least, not upon tenacious soils."

APPLICATIONS OF CHEMISTRY TO THE USEFUL ARTS, BEING THE SUBSTANCE OF A COURSE OF LECTURES DELIVERED IN COLUMBIA COLLEGE, NEW-YORK, BY JAMES RENWICK, PROFESSOR OF NATURAL EXPERIMENTAL PHILOSOPHY AND CHEMISTRY.

V.

CARBON, HYDROGEN AND THEIR COMPOUNDS.

(Continued from August No.)

4. MANUFACTURE OF COKE.

AUTHORITIES.—KARSTEN. Metallurgie de Fer.
DUMAS Chimie appliquee aux Arts.
BEAUMONT and DUFRENOY. Voyage Metallurgique.

Rationale.—Coke bears the same relation to bituminous coal, which charcoal does to wood, and is, like it, obtained by distillation at a red heat. Bituminous coal is a compound of carbon, hydrogen, and oxygen, in very various proportions. In the variety called cannel coal, the proportion of hydrogen amounts to 5½ per cent. in the Liverpool coal it is about 3¼ per cent., and in the slaty varieties does not exceed one per cent. The quantity of carbon varies from 75 per cent. in cannel coal, to 90 per cent. in that of Newcastle. The proportion of oxygen in cannel coal is about twice as great as would suffice to convert the hydrogen into water; in the Newcastle coal about four times as great; and in the slaty varieties, it but little exceeds the proper relation.

Coals may be divided into three varieties:

1. Those which contain at least three per cent. of hydrogen, and, at most, as much oxygen as will convert half the hydrogen into water.

2. Coals which contain oxygen in such quantity as to convert two-thirds of the hydrogen into water.

3. Coals which contain oxygen enough to convert the whole of the hydrogen into water.

The first of these varieties fuses when heated, and the excess of hydrogen uniting with a part of the carbon, escapes in the gaseous form; by the formation and escape of gas, the coke is rendered light and porous. The second variety fuses also, but the quantity of gas formed is not sufficient to render the coke porous, it is therefore compact and massive.

The third variety does not fuse, and the escape of the vapor of water reduces the mass to the form of powder.

Coal of the first class increases in volume when it is coked; the other two varieties yield coke in less volume than the coal employed. In their uses in the arts, the first furnishes the most valuable coke; the last that of least value.

Coke may be prepared in iron cylinders or retorts, but this is only done when the volatile products are to be collected; this method will therefore be described when we treat of the preparation of gas for illumination. Treated in this way, cannel coal yields about 50 per cent. of coke, and that of Newcastle as much as 80 per cent.

When the distillation is performed at a low temperature, the weight of coke is increased, but its volume and porosity are diminished. It is therefore advantageous, when the volatile matters are not the principal object, to effect the decomposition of the coal by a sudden and high heat.

Preparation.—When coal is rich in hydrogen, it may be readily coked in heaps resembling the *pits* used in preparing charcoal. The coal must be in pieces having not less than three or four inches in each dimension. The heaps are conical, having a base 15 feet in diameter, and a height of about 30 inches. The heap may be best covered with straw, on which is laid a layer of moist earth, the straw being so applied that the earth cannot enter into the spaces between the pieces of coal. But as the use of straw is expensive, it is more usual to cover the large coal for about the height of a foot from the ground with smaller pieces, and the outside with coal-dust; the top of the heap is covered with the refuse coke which is left in the form of powder, in handling that obtained in previous operations. The heap being finished, a few lighted coals are dropped into an opening of six or eight inches in depth left in the top; the space is then filled up with fragments of coal, and when the combustion has fairly commenced, the whole is covered with earth or refuse coke. The rest of the process is much the same as that of preparing charcoal, but is easier, as coal when in mass will not continue to burn after the gaseous matter has escaped, unless new surfaces be exposed to air.

In heaps of greater diameter and height than we have described, the combustion would be too slow at first to form a porous coke, and so rapid at the end as to render it difficult to extinguish. Yet so large is the quantity of coke which is required in some instances, and particularly in the manufacture of iron, that heaps of so small a size would be attended with inconvenience. The shape of the heap is therefore changed in such cases from a cone to a long prism. The breadth of this must not exceed 15 feet, nor its height 3 feet, but its length may be unlimited. This prism must be set on fire in the mode we have mentioned at several points on its upper edge. In this way not only may a greater quantity of coke be prepared at a single operation, but the time is shortened, the conical heaps requiring three or four days for their conversion into coke, while the prisms are finished in 24 hours.

The product is usually about 40 per cent., but some coals, that of Virginia for instance, yield 50 per cent. If a coal, in consequence of its containing but little hydrogen, does not burn freely, it cannot be converted into coke in this way. Such a coal was found in Yorkshire, (England,) in association with minerals which would render the manufacture of iron profitable. In order to apply it to this purpose, an intelligent manufacturer (Wilkinson) imagined the application of a chimney, for the

purpose of obtaining a more powerful draught. This chimney is conical in form, about a yard in height, and as much diameter at bottom; the diameter at top is two feet; it is built of brick, the lower courses of which are laid in such manner as to leave openings. Around this chimney the coal is piled in a heap, whose radius is about 6 feet greater than the outer radius of the chimney. This heap is composed of alternate layers of large and small coal, the lowermost layer being of pieces of the largest size. The surface of the heap is covered with ashes or refuse coke, and fire is applied by throwing burning fuel into the chimney. Wet ashes are kept on hand to close any cracks which may occur in the cover of the heap. Dense smoke flows from the chimney, and is followed by a blue flame; as soon as this appears, the top of the chimney must be closed by a plate of cast iron and the combustion will speedily cease.

The coal of Pittsburgh, Pa., as far as we can learn, must resemble in quality the coal employed by Wilkinson, for although far removed in character from anthracite, it has not hitherto been converted into coke by the use of the mode first described. We cannot but express our belief that the method of Wilkinson would be found sufficient for the purpose and that by its aid the manufacture of iron from the ores might be introduced into that city, which at present receives almost all the pig iron used in its extensive foundries and forges, from the opposite side of the Alleghany range of mountains.

This method has also been introduced, with some modifications in Staffordshire, where the coal is of better quality. Here the coarser coal is placed in contact with the chimney, and the finer at the outside of the heap, the whole being covered with ashes or refuse coke, leaving a few openings for the admission of air. As soon as the coke is finished, water is poured on the heap to extinguish the combustion. In this way the product of coke is raised from 40 to 50 per cent.

All the methods of which we have spoken require that the coal should be principally of that size which is of most value for other purposes, namely in coarse fragments. Much however of all good coal is reduced to dust in its extraction from the mines, and in the handling it must undergo. This, in most parts of England, is totally lost, and it has even been necessary to burn it in heaps in order to get rid of it.—In France, where coal is more scarce, and consequently of more value, it has become an important object, that none but such refuse coal should be converted into coke, and the coarser pieces left to be employed for other purposes. This object has been successfully accomplished in the neighborhood of St. Etienne.

The heap in which the coal is burnt may have the form either of a truncated cone or oblong truncated pyramid. The latter form is the most easily constructed, and described. A case of plank is formed, having the desired figure, say a base of 50 or 60 feet in length by 4 feet in breadth, a height of 3½ feet; and the planks are so inclined as to make the dimensions of the upper surface two feet less in each direction than that of the base.

The planks which form the ends of the case are each pierced with four holes: one at the base, one directly over it and near the top, the other two at half the height of the plank, and in the vertical plane of the upper edge of the sides. Each side is also pierced with three ranges of holes, having the same arrangement in quincunx as those of the ends, and at the same distances.

These holes serve for the introduction of tapering spars. The spars of the lowermost layer are passed through the holes in the sides and ends, at right angles to the respective direction of these surfaces, and at the angles where the spars meet each other, vertical spars are set up. The second range of spars is inclined to the sides in such manner as to meet the vertical spars; and the third layer has the same direction as the first.

The fine coal is prepared by mixing it into a paste with water, by means of a hoe. It is then thrown into the case, and well rammed upon the lower range of spars, until a bed has been formed to receive the second range of spars. This latter range being placed, more coal is thrown in and rammed, until the height of the third range of spars has been reached, and this being introduced, the rest of the case is filled in the same manner.

In order to lessen the expense of the wood employed, the heap may be built in successive portions, each ten or twelve feet in length, and when one portion has been finished, the planks and spars are removed to enclose and form passages in a second portion. The spars form conical passages in the mass, by which air may be admitted during the combustion. When the heap has thus been completed and covered with ashes and refuse coke, all the wood is removed, and the heap is set on fire by igniting small heaps of coarse coal upon each of the openings left in the upper surface by withdrawing the vertical spars. It has been found that in pyramidal heaps, about $\frac{1}{26}$ part of the coal to be coked is required for this purpose; but in small conical heaps, where a single vertical spar will suffice no more than $\frac{1}{15}$ will be used.

The attention of the workmen must be directed not only to close the cracks which may appear in the cover, but to keep the passages left by the spars open by means of iron rods. The completion of the process is known by the cessation of the flame. Water is then introduced into the lower passages, whose steam in passing through the incandescent heap is decomposed, and furnishes hydrogen which escapes in flame. The heap is then covered closely with earth, and left until it cools.

In this way coal which would otherwise be lost, yields 50 per cent. of coke of excellent quality.

When coal of the first variety (with the exception of cannel coal) is distilled in close vessels it yields from 70 to 80 per cent. of coke, by the combustion of about ten per cent. of coal. As the best of the methods we have yet described yields no more than 50 per cent., and the most common of them no more than 40, there is obviously a very great waste. In the neighborhood of coal mines this is more than compensated by the simplicity and facility of this process. But at a distance from mines a more economic process is necessary, unless coke can be transported from this vicinity, which is by no means easy, in consequence of its friable character, and its being liable to injury by being wet. The best apparatus for this purpose is called the coking oven. This is formed of a cylindrical wall about 2 feet in height surmounted by a dome, from the summit of which rises a chimney about 18 inches in height. In the circular wall is a door about 18 inches by 12 inches, having an iron shutter. The coal is introduced through the chimney, and spread by a rake over the floor, to an uniform depth of about 4 inches. Burning coals are then dropped through the chimney, and as soon as the ignition is fairly commenced the door is closed. When a blue flame begins to appear at the chimney, the top of it is closed by a plate of iron. In this method about one half more coke is obtained than by the ordinary heaps.

Large spheroidal kilns, and reverberatory furnaces have also been used, but their principal object was the preparation of the coal tar. As this article has not proved to be of any great value, and is besides produced at gas-works in quantities greater than can be consumed, it is unnecessary to describe these kilns and furnaces.

It may be here mentioned that turf or peat may be carbonised as well as coal or wood. The fuel thus produced is of very excellent quality, and may be applied to the same purposes as that obtained from wood or bituminous coal.—Pits as used in preparing charcoal have not been found well adapted to the preparation of the charcoal of turf. The little that has been made of good quality was prepared in iron cylinders, but as this is too expensive for manufacturing purposes, it appears probable that if it should ever be necessary to carbonise turf on a large scale it will be done in kilns like those described under the head of charcoal.

5. LAMP-BLACK.

AUTHORITY.—Encyclopedie Methodique.—Arts at Metiers.

Lamp-black derives its name from its having been originally obtained by collecting the soot of lamps. This method is still used in some cases. Linen wicks are immersed in linseed oil and lighted; the smoke is received in a copper vessel on which the soot is deposited. What is called ivory black was made at first by receiving the smoke of similar wicks upon plates of ivory.

At present lamp-black is manufactured on a large scale, by burning refuse resinous substances, or even from the soot of coal. When resinous matters are employed, they are placed in a kettle over

a furnace, and free access of air is admitted over the mouth of the kettle. The resinous matter being heated fuses at first and finally takes fire, giving out a dense smoke. This smoke instead of being carried off by a chimney, enters a lofty circular chamber; the roof of which is conical with a single opening in the centre. From this roof a cone of sheet iron is suspended by a pulley, and nearly fills up the area of the chamber; this cone has also an opening in the centre. The interior of the chamber, and the lower surface of this cone are covered with coarse woollen cloth or with sheep skins. Upon these the soot settles, and may when the combustion is over, be separated by drawing the sheet iron cone up and down by means of the pulley.

Lamp-black is extensively used as a paint, and there are other forms of vegetable charcoal which are applied to the same purpose. Even common charcoal reduced to powder is sometimes so employed

Blue black is formed by burning the kernels of the peach in crucibles, to which the covers are carefully luted, with but one opening for the escape of the gas.

A very fine black is made by treating the twigs and tendrils of the vine in the same manner. The article called black chalk, and used in the manufacture of crayons, or for drawing, without preparation is the charcoal of a shrub (*fusain*) which grows in France

The black used in Europe by engravers is made from a mixture of wine-lees, peach-pits, ivory and bone, calcined and ground to powder. It is prepared for use by making it into a paste with linseed oil.

6. ANIMAL CHARCOAL.

AUTHORITIY.—DUMAS, Chimie appliquee aux Arts.

History.—In the preceding section we have mentioned the original mode in which ivory-black was prepared. For that method, the calcination of fragments of ivory in close vessels was substituted, and it was speedily found that an article little inferior was to be obtained from bones. Still, so long as the sole use to which either was applicable was in the art of painting, this observation was of little value. At the end of the last century, however, it was discovered that carbon, in any form, had the property of discharging the colors, taste and smell of liquid vegetable substances. Common charcoal was at first used for this purpose, but in 1811 it was discovered by a chemist in the south of France, that animal charcoal was much more powerful in its effects, and was capable of separating rapidly and certainly, vegetable coloring matter from any liquids whtasoever. Since that time the manufacture of animal charcoal has risen to great importance, and we shall hereafter have occasion to cite several important applications that have been made of it in the arts

Preparation.—Animal charcoal is usually prepared from bones, and at the same time ammonia is obtained. We have had occasion to refer to this process under the head of that alkali. Some farther details are, however, necessary. The carbonisation of bones is performed in cast iron cylinders, similar to those used in the manufacture of nitric and muriatic acids. The tube which conveys off the volatile matter must be three inches in diameter, and connected with a series of three necked bottles.—The opposite end of the cylinder to that where the tube issues is closed by a dish, which has no opening in it. The bones are broken to pieces and freed from the fat by boiling. They are placed in the cylinders and kept at a red heat for thirty-six hours; at the end of this time they are taken out, and shut up in close vessels to prevent combustion, until the charcoal is cold. The charcoal is then stamped into coarse powder, and finally ground between millstones into fine meal.

If it is to be used as a paint, it is again ground with water, and then dried in earthen moulds. Another form of animal charcoal which was formerly lost, is that left in the preparation of Prussian blue. In this manufacture blood is calcined with potash, and the charcoal is obtained by washing off the alkali.

APPLICATION OF ANIMAL CHARCOAL TO THE DISCHARGE OF VEGETABLE COLORS.

The action of charcoal in discharging colors seems to be owing to the same cause as its power of condensing gasses; of one of which it takes up 90 times its own bulk. The action in this case is due to a mechanical attraction, and to this we may ascribe its powers of retaining the coloring matter of liquids filtered through it. Animal charcoal, upon this theory, owes its superior effect to its greater degree of division; this minute separation of its parts is evident from the fact, that the actual carbonaceous matter in calcined bones does not exceed ten per cent. and is yet sufficient to give its intense black color to the remaining mass of phosphate and carbonate of lime. In that obtained in the manufacture of Prussian blue the division is still more minute, as it is in fact a chemical precipitate from the blood employed, it has for this reason a still more powerful effect. In consequence of this divisibility a larger surface is provided by which the attraction may be exerted.

The liquids which best evince the powers of charcoal in discharging colors, are the solution of indigo in sulphuric acid and molasses. The relative powers of different forms of charcoal on these solutions are exhibited in the following table, the power of that obtained from bones, without further preparation being taken as the unit.

	Indigo.	Molasses.
1. Calcined bones,	1.00	1.00
2. Soot of vegetable oil fused with artificial phosphate of lime,	2.00	1.90
3. Calcined bones from which the phosphate of lime has been washed by muriatic acid,	1.87	1.60
4. Calcined bones again calcined with potash,	45.00	20.00
5. Albumen or Gelatine calcined with potash,	35.00	15.50
6. Blood calcined with potash,	50.00	20.00

In order to render the above table useful it is to be stated that a given quantity of calcined bones will discolor the solution of one thousandth part of its weight of indigo, or nine times its weight of molasses. After producing this effect it will not act again until the coloring matter absorbed has been separated by calcining the charcoal a second time.

As an instance of the use of these substances in the arts, we may cite an article well known in our markets. The made wine, called Marseilles Madeira, is prepared from the common red wines of the south of France. Their deep color is discharged by filtering them through animal charcoal, and they are made up to the American palate by the addition of brandy. The peculiar smell and taste of the original wine is discharged at the same, and it is thus ready to receive such as may be given it artificially.

Animal has similar advantages over common charcoal in the rectification of spirituous liquors. By its use, all the peculiar and often offensive taste and smell of these liquors may be separated. We shall have occasion to treat of these uses of charcoal under their proper heads.

A carbonaceous substance, having powers in these respects about equal to calcined bones, has been prepared from a species of shale charged with bitumen, which is found in some geological formations, and particularly in the strata of coal fields. In the separation of the volatile matter the shale becomes extremely porous. It is therefore well adapted to the construction of filters, which may be made of slabs of the carbonised rock.

7. GAS-LIGHT.

Rationale.—Bodies which burn with flame must be either volatile, or capable of furnishing a gas when heated. Thus, phosphorous and sulphur burst into flame, when their vapor escapes freely, and the vapor of alcohol is readily ignited. Any aeriform body whatsoever, if intensely heated, assumes the appearance of flame. In oleaginous, resinous, and bituminous substances, a red heat causes a decomposition, and new combination of their elements; these new combinations are both gaseous and volatile, are readily ignited, and in burning form flame. Thus in a common fire of bituminous coal, bitumen is first formed; this is again decomposed by the heat, yielding tar and gaseous carbeurts of hydrogen; the former yields vapor, which in mixture with the gas burns with flame. In a common lamp or candle, the wick composed of inflammable matter readily takes fire; the heat thus produced melts the tallow, when that is used; the liquid tallow, or oil, is drawn up by capillary attraction into the pores of the wick, and coming in contact with its ignited part, is decomposed and yields carburetted hydrogen; this is set on fire by the ignited wick, and flame is formed.

Gases do not become luminous, nor af-

sume the appearance of flame, except at very high temperatures, far higher, indeed, than those at which solid bodies become luminous. If then, a gas, when heated in the act of combining with oxygen, so far as to become luminous, should deposite a solid body, or if the product of the combustion should have the solid form, the flame will be brilliant; but if the product of the combustion remain in the state of gas or vapor, the flame will give but little light.

Thus, when phosphorus is burnt, the whole product is solid, and the flame has the greatest brilliancy of any that is known; when heavy carburetted hydrogen, (olefiant gas) burns, a part of its carbon is deposited, which, disseminated through the flame in a solid form, gives it the lustre due to an intensely heated solid; but when hydrogen or alcohol are burnt, even by the aid of a stream of oxygen, which causes the greatest heat of any known combustion, the flame will have so little brilliancy as to be hardly visible in the bright light of day, because the products are aqueous vapor and carbonic acid gas.

Combustible bodies may not only be decomposed directly in a fire, or by the aid of wicks, but they may be heated in close vessels, and the gases which are evolved may be kept in proper reservoirs until needed for the purpose of illumination.—From these vessels they may be carried in pipes to the place where the light is needed, and inflamed by an ignited substance as they issue from beaks of some convenient form.

When combustible bodies, whose principal constituents are carbon and hydrogen, are decomposed by heat, these elements may be either wholly separated or may enter into new combinding. The products are therefore carbon in the solid form which remains in the apparatus where the decomposition is performed; hydrogen uncombined; light carburetted hydrogen, olefiant gas or heavy carburetted hydrogen; liquid carburets of hydrogen; and tar. In the present case the residuum of carbon need not be spoken of, nor would we have any thing to add to what has been stated under the heads of Coke, and the several varieties of charcoal. Hydrogen has the smallest density of all known bodies, and in burning produces the most intense heat; but as the product of its combustion is aqueous vapor, and that extremely rare in consequence of being generated at a very elevated temperature, the flame has so little brilliancy as to be hardly visible in the light of the sun. Light carburetted hydrogen is a compound of one equivalent of carbon to two of hydrogen. The density of the compound is increased to eight times that of hydrogen, or the numbers which respectively represent these specific gravities are 1 and 8. In a close vessel it is not affected by a heat below one approaching to whiteness; but at a white heat or a little below, it is decomposed, and deposites its carbon. When burning freely, sufficient heat is generated to produce this decomposition, and the carbon deposited in the flame having the solid form, and therefore becoming more luminous than the hydrogen or the aqueous vapour which that gas forms gives brilliancy to the flame. Light carburetted hydrogen is not absorbed by water to any appreciable extent.

Olefiant gas contains twice as much carbon as light carburetted hydrogen, and may be considered as a combination of one equivalent of each of its constituents; the volume of the hydrogen is reduced one half, and the density of the compound is fourteen. Even at a low red heat, olefiant gas begins to decompose, depositing half its carbon, and being thus converted into light carburetted hydrogen whose density is lessened in the relation of 8 to 14. At a full red heat it is completely decomposed. In burning therefore it deposites twice as much carbon from an equal weight of gas, furnishes a flame of equal size to that of twice its bulk of hydrogen, and which is far more brilliant, in consequence of the quantity of carbon deposited in the flame being twice as great.—Olefiant gas is therefore the most valuable of those generated by the decomposition of combustible bodies, and in the manufacture of them every exertion should be made to obtain it in the greatest quantities, which the nature of the material will admit, and to preserve it from waste after it is formed. The most obvious cause of waste is its having a greater degree of solubility in water, than the light carburetted hydrogen or pure hydrogen; water taking up one eighth of its own bulk.

Two liquid carburets of hydrogen were discovered by Faraday to exist in gas. These are very volatile, one of them boiling at 60 Fahr. and the other as low as the freezing point. Both of these may therefore exist in vapor at mean temperatures, and the latter under almost all circumstances. They both contain more carbon than olefiant gas, and therefore furnish a flame of greater brilliancy, but it may happen that all the carbon they deposite is not consumed, and thus, too great a proportion of them may take the form of smoke.

The vapors of these carburets agree with olefiant gas in one property, viz., they are decomposed by chlorine, rapidly and without the aid of light, while hydrogen, and light carburetted hydrogen, are condensed by it more slowly. As these vapors and olefiant gas are more valuable for illumination, the measure of the quantity of a given mixture which is condensed on the first application of chlorine is the best of all tests for the value of gas intended for illumination.

Another liquid carburet, analogous to Naptha is likewise produced in the decomposition of coal. As this does not boil below 180°, but little of its vapor can be present at ordinary temperatures: but if present it produces a dense smoke except in burners of the best form.

The tar need only be mentioned here in consequence of its being capable of decomposition by being returned to the apparatus, and thus of yielding the gaseous and volatile compounds just spoken of. In the laboratory, or under circumstances where the heat may be carefully regulated, the character of the products may be varied to a very great extent. From bituminous substances little else but tar may be obtained, and oleaginous substances will yield little but their own vapor, if the apparatus be not permitted to become red hot. If allowed to rise to a low red heat, olefiant gas, and the two volatile carburets will become the principal products; at a higher heat light carburetted hydrogen; and at a white heat uncombined hydrogen. In the successive stages of the process, the several substances will come over mixed in various proportions, and each in its turn will cease to appear.

In manufactories on the large scale, such nicety is impracticable, nor is it ever necessary. It is then sufficient to divide the matters which are used into two classes, each of which requires a peculiar management.

The first class comprizes those substances which do not decompose rapidly until the light carburetted hydrogen is formed. These must be subjected to a full red heat; for an attempt to obtain the more valuable compounds would be attended both with delay and a waste of the material. Still as some olefiant gas will be formed, no more water should be used in purifying them than is absolutely necessary to remove offensive matter.—Coal is a body of this class.

The second class comprizes those which may be decomposed with sufficient rapidity, at a temperature consistent with the existence of olefiant gas. These ought to be treated at the lowest temperature which will ensure the decomposition of their own vapor; one which merely gives a red glow to the surface of the iron vessel used in the process is sufficient for the purpose. To this class belong oils, and the solution of rosin in spirits of turpentine.

History.—The adaptation of a wick to oil or tallow, in order to obtain light by the decomposition of these substances, and the ignition of the gases and vapors they yield is among the oldest of human inventions. On the old continent neither tradition, written history, nor even mythological fable reach the epoch of its discovery.—Yet it must have been introduced prior to the separation of the races which peopled the two continents; for while in the ancient world there is no tribe so rude and savage as not to be acquainted with the use of the lamp, even the polished nations which occupied Mexico and Peru were ignorant of it. The only inhabitants of the Western hemisphere who used wicks were the Esquimaux, and if they be an ancient American race, they may have derived this information from Greenland, which was peopled at a remote era by a Norwegian colony.

The idea of separating the two processes which take place in the wick, effecting the decomposition at one time, and storing up the gases for use did not appear to have occurred to any one until the year 1785, when it was proposed by a French engineer of the name of Lebon. This was applied to the distillation of wood, and he endeavored to collect at the same time the

pyrolignous acid which was evolved. It does not appear that this use of his invention was attended with any valuable result. In this country, however, about 30 years ago, the apparatus of Lebon was manufactured in Baltimore, and occasionally used for the distillation of bituminous coal. The retort employed was of the shape of a flower pot and made of iron; to this a cover was fitted by grinding, whence a pipe proceeded; and the pipe was usually divided into two branches each of which terminated in a burner. The retort being filled with coal was set in a common fire, and the gas ignited when it began to escape from the burner. In order to prevent the offensive smell of the gas from being apparent, the lights were kept beneath the chimney.

Previous to the year 1806 the factories of Watt and Bolton at Birmingham, and of Philips and Lea at Manchester were lighted by gas obtained from coal; and in the ten years succeeding, it was generally introduced into all the large manufactories of Great Britain It was also occasionally used in smaller establishments, and in particular at Ackerman's in London, whose example had a powerful influence in bringing it into public notice. When first applied, no attempt was made to purify the gas, its use was therefore extremely offensive, and by no means wholesome. During the ten years of which we have spoken the character of the gases evolved in the decomposition of coal were chemically examined, and by the aid of science, the mode of separating every offensive substance, and most of those injurious to combustion discovered.

In 1815, some streets in London were lighted by coal gas distributed in pipes, and in 1816 the method became general in that city.

In 1817, Taylor and Martineau began the decomposition of oil, which, when properly treated, yields a gas of far greater illuminating power than is given by coal Previous to this time Mr. David Gordon, a gentleman for many years a resident of the United States, had proposed to render gas portable by condensing a number of atmospheres in strong metallic vessels. So long as no gas but that from coal could be obtained the method promised but little success. On the introduction of oil gas however, the plan was resumed and carried into successful operation. By this method, ships, steamboats, railroad and other carriages may be furnished with the beautiful and safe light given by oil gas; and if it was compelled to give way before the immense capital vested in coal gas manufactures in the British capital, there is little doubt that it might be applied to advantage in a new and open field; particularly in countries where coal bears as high a price as it does in most of our Atlantic cities.

The manufacture of gas from rosin as now usually conducted, was the invention of Professor Daniell of King's College, London. It has, however, been conducted on a large scale no where except in the city of New-York. Mr. Rembrant Peale was however, probably the first who prepared gas from this material, although he treated it in a different manner. The Museum in Philadelphia was lighted under his direction by gas prepared from rosin as long ago as 1814.

a. Coal Gas.

Rationale.—Bituminous coal is composed of carbon and hydrogen in variable proportions. It also contains sulphuret of iron, and according to some, oxygen and nitrogen. We are, however, rather inclined to ascribe the presence of the former partly to the water mechanically combined with the coal, and partly to atmospheric air which cannot be entirely excluded. The latter may also be accounted for, at least in part, by the presence of atmospheric air.

When bituminous coal is distilled at a red heat its elements enter new combinations, the greatest number of which are volatile, although the carbon which is left is greatest in quantity. The volatile products are partly gaseous and partly condensible. The condensible products are:

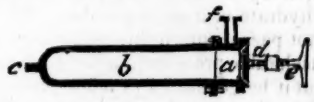
1. Water, arising from the moisture of the coal, or a new combination of its elements;
2. An oil of the character of Naptha;
3. Tar;
4. Sulphuret of carbon.

The gaseous products are:

1. Hydrogen, Light Carburetted Hydrogen, and olefiant gas, being new combinations of the elements of the coal;
2. Carbonic oxide, } arising from the
3. Carbonic acid, } combustion of the carbon of the coal in the atmospheric air which cannot be excluded;
4. Sulphuretted hydrogen, formed by an union of the sulphur of the sulphuret of iron with a part of the hydrogen of the coal;
5. Sulphurous acid formed by the sulphur of the sulphuret and atmospheric air;
6. Ammonia; the nitrogen of the air combined with hydrogen from the coal;
7. Nitrogen.

Of the condensible products so much of the oil as can be retained in the state of vapor is advantageous in the combustion, but is apt to be inconvenient and may be dangerous when it condenses in the pipes and burners. The sulphuret of carbon is luckily in small quantities, as it is condensible with difficulty. Of the gases; hydrogen and the carburets of hydrogen are the useful substances for illumination; carbonic oxide burns with a flame of little brilliancy, and is not injurious, although of little value. Carbonic and sulphurous acids, and ammonia do not burn; being also destructive of combustion they would lessen the heat, and therefore impair the brilliancy of the flame. Sulphuretted hydrogen burns, but has a most disagreeable smell, as have also sulphurous acid and ammonia. It is obvious therefore, that the vapors ought to be condensed, and all the gases except the hydrogen, its carburets, and the carbonic oxide separated.—Cooling in a proper refrigerator will effect the first object, and the condensed water will retain the ammonia, with some of the sulphurous acid and sulpuretted hydrogen. Lime has so great an affinity for carbonic acid that it may be employed to separate it and the residue of the sulphurous acid and sulphuretted hydrogen, being soluble in water might be condensed by washing in that liquid, were it not for the loss thus caused of olifiant gas. In the course of practice it was however, discovered that lime has an attraction for sulphuretted hydrogen, and that its affinity for sulphurous acid is sufficient to cause that gas to be retained. The process of washing is therefore no longer considered absolutely necessary.

Manufacture.—Those coals which, in treating of coke, were arranged in the first class, are alone fit for the preparation of gas. Of these, cannel coal furnishes the largest quantity, and its product is richest in the most valuable gas, the olefiant. Any coal of this class, however, which can be obtained at a low price will answer the purpose. The decomposition was orginally effected in retorts, but is best performed in cylinders of cast iron. As it has been found that the front of the retorts resisted the fire for the longest time, and that the opposite end might be burnt away, while the first remained perfect, they are now usually formed of two pieces. These are united by screw-bolts, and their joint rendered tight by a cement formed of iron-filings sulphur and muriate of ammonia. The front of the cylinder is slightly bevelled, in order to receive an iron stopper.—This is held in its place by a screw adapted to the middle of an iron bar, which is fastened over the stopper. The pipe by which the volatile matter escapes, proceeds from the top of the cylinder near the stopper. Such a retort is represented in fig. 1.



a, Anterior portion of the retort;
b, Posterior do. do.;
c, Projection, built into the wall of the furnace;
d, Stopper;
e, Screw;
f, Pipe which carries off the gas.

Five such cylinders are usually arranged in one furnace, and the number of furnaces increased with the quantity of gas needed. The several furnaces communicate with a single large chimney, usually of a conical shape; and in some of the best establishments, a separate flue is carried up from each furnace, for a short distance within this cone.

In order to exclude atmospheric air, when any of the retorts are opened for charging and cleansing, and to prevent the reflux of the gas into the retorts where the decomposition is complete, the tubes which convey the gas are bent down into a common receiver, usually of a cylindrical shape and placed horizontally. This cylinder is about half full of water, into which the several tubes dip, each to the depth of an inch. The bend of the tube must be so high above the surface of this water as to prevent the pressure of the gas from forcing the water over it into the retort.

The condenser is formed of a series of cast iron pipes immersed in a cistern of water, which must be kept cool by constant renewal. The pipes must be laid in a sloping position, or communicate with a

sloping pipe, in order that the condensed matter may run along them. At the lowest point in this series, a pipe proceeds downwards to a reservoir which receives the condensed substances. In order to prevent the entrance of air, the end of this pipe must be constantly immersed in water. The reservoir will receive by this pipe the tar, water charged with amaronia, with a part of the oil, and of the sulphuret of carbon.

The gaseous matter which remains is purified by bringing it in contact with the hydrate of lime. The first mode used for this purpose, when the separation of the carbonic acid was supposed to be the only purpose which could be effected by means of that earth, was to pass the pipe which proceeds from the condenser downwards, into a close vessel nearly filled with milk of lime. The gas, escaping from the open end of the pipe, rose upwads through the liquid, and was carried off by a pipe issuing from the top of the vessel. When the partial condensation of other gases was found to take place, it became evident that this effect might be increased by bringing larger surfaces of the two substances into contact with each other. This was at first attained by a contrivance by which the liquid was made to fall through the gas in a shower. This apparatus was complex in its form, and as it has been replaced by better methods, need not be described.

In one of these the gas is made to pass through a vessel filled with hay or moss, prepared by wetting, and then dusting it with hydrate of lime in powder. The gas will not pass through this without exerting a considerable pressure, and as it is necessary that it be generated at a low pressure, it is frequently received in a gasometer before it reaches the vessel filled with the purifying material, and drawn from this gasometer by pumps, which force it through the vessel containing the lime.

Even in this mode, the water absorbs a part of the olefiant gas. Hence, a method which has only been practised in one instance, namely, at Perth in Scotland, is to be preferred to any other. In this the gas is caused to descend through a number of successive layers of dry hydrate of lime.—In this instance, from the care with which the heat is regulated, and this improvement in the purification, gas from cannel coal has been made to approach in density and illuminating powers to that yielded by substances of the second class.

From the purifying apparatus the gas passes to the gasometer, which serves as a reservoir, where it is stored up until needed. This has the form and character of the vessels known under that name in laboratories, but is of course of great size.—The cistern of the gasometer may be constructed of brick laid in hydraulic cement, or of flaunched plates of cast iron, which are connected by screws. The receiver is usually made of sheet iron.

This receiver is counterpoised by a weight suspended from pullies by chains, and the chains are made of such a weight that the part which passes over the pulley as the receiver rises, shall be equal to the weight of the water displaced by that portion of the receiver which is raised from the water during the motion of that part of the chain. In this way the receiver may be always exactly counterbalanced by the weight and the chain.

In some cases the pullies are supported by a hollow column of cast iron, rising from the bottom of the cistern through the middle of the receiver. The receiver has a hollow cylinder of sheet iron formed around its axis for the passage of the column.—The counterpoising weights move within the hollow of the column

These things being premised, we may proceed to the description of an apparatus for preparing coal gas, with reference to the annexed figure 2.

a, *a*, Retorts.

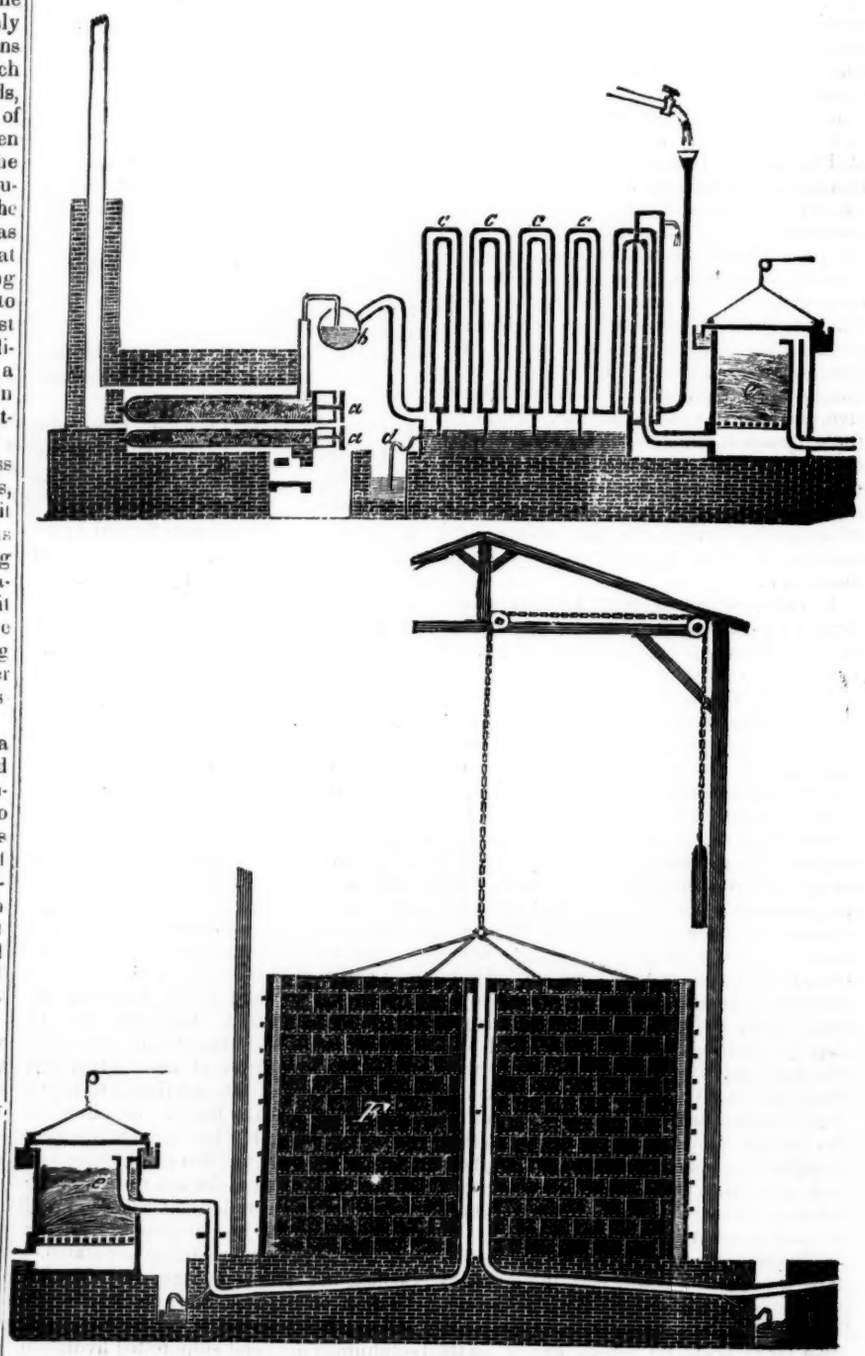
b, Receiver.

c, *c*, *c*, Condenser, composed of a system of iron pipes, kept cool by a stream of water.

d, Tube by which the coal-tar is discharged.

e, *e*, Vessels in which the gas is purified by means of quick lime.

F, Gasometer, which is represented as being enclosed in a cistern of cast iron.



It is usual to have but one, or at most two gasometers, and to place them in the immediate vicinity of the place where the gas is manufactured. But it is a much better plan, where a large district is to be supplied with gas, to place in its different

quarters separate gasometers, each capable of furnishing the supply of a single night to the nearest burners. These are to be filled during the day time, and for this purpose a single gasometer, of the same size with each of them, will suffice. In this method the large main pipes may be replaced by smaller ones leading to the several local gasometers, and the rest of the distribution effected by small pipes. A great saving will thus arise in the cost of the pipes, and the supply will be more regular. The pipes which convey and distribute gas ought to be laid in the ground to such a depth as to be beyond the reach of any great or sudden changes of temperature. They are made of cast iron, in lengths of about 9 feet. One end of each is cast large enough to receive the smaller end of the next pipe, and the joint is closed by oakum dipped in white lead ground in oil. Melted lead is then run in above this packing. This is called a spiggot and faucet joint. It may be rendered more secure by casting flaunches near the ends of the pipes, and uniting them by screw-bolts and nuts. This method however cannot be adopted when the pipes are liable to endure changes of temperature.

In the preparation of coal-gas, the purification is the most important point. It is only in a single instance that its value has approached to that of good oil gas, by reason of its containing more than the usual quantity of olefiant gas. The low heat at which alone such a decomposition can be effected would probably lead to an increase in the quantities of tar and naptha, substances now of but little value except to be returned to the retorts. It is therefore still a point on which we can state no positive opinion, whether coal shall be converted into gas in the usual manner, or whether by due regulation of the heat a less quantity of gas, but yielding a more brilliant light, shall be sought, in preference to a gas principally composed of light carburetted hydrogen. If olefiant gas become, by a resolution of this question in the affirmative, the important object, the rules mentioned under the next head must be resorted to. If, however, the production of such a gas should appear to be difficult, the mode now in use, of heating the cylinders to a high red heat, will probably be persisted in.

6. MANUFACTURE OF OIL-GAS.

Oil is decomposed in a cylinder or retort, similar in form and character to that employed in obtaining coal gas. This retort is filled with coke, and when it is brought to a dull red heat, a fine stream of oil is admitted at the end farthest from that to which the pipe which carries off the gas is applied. The oil therefore traverses the red hot coke, and is in a great degree decomposed. The products are,

1. Olefiant gas, light carburetted hydrogen and hydrogen;
2. Vapor of oil;
3. The two highly inflammable liquid and volatile compounds of carbon and hydrogen, which have been heretofore mentioned.

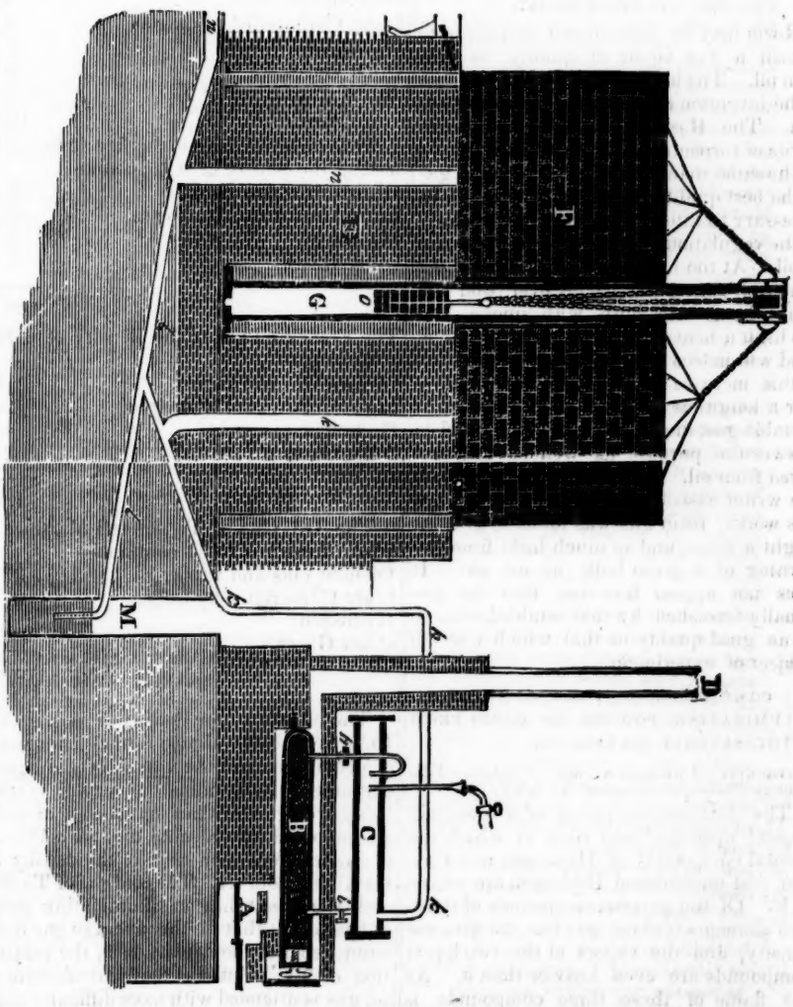
The gas in its escape from the retort, passes through the reservoir by which oil is supplied. Here a part of the vapor of oil is condensed. A pipe then conveys it from the upper part of this reservoir to the gasometer. This pipe must have one part of it laid in an inclined position, in order to permit the condensed oil and inflammable liquids to flow along it, and from the lowest point of this pipe another proceeds which conveys them to a proper receptacle.

The pores of the coke are gradually filled up with carbon deposited by the oil; it then ceases to perform its part in decomposition. It therefore becomes necessary to withdraw and replace the coke about once a fortnight. In opening the retort certain simple precautions are necessary to prevent the formation of an explosive compound, which might burst the retort.

It is not necessary that the oil whence gas is prepared should be of the quality which is required to give an agreeable light in a common lamp. Common whale, or even fish oil, and the unpurified oils of vegetables give a gas as good as that obtained from winter strained spermaceti. Its cost is therefore by no means as great as might be imagined. In this country in particular it might be applied to bring into use an article which is now generally permitted to be wasted, namely the seed of the cotton; and it is said that an attempt is now making in New-Orleans to light that city by gas from this material. The seed might also be used for this purpose without having undergone the operation of expressing the oil from it.

An apparatus for the manufacture of oil gas is represented. Fig. 3.

A. Furnace;
B. Retort, filled with coke;
C. Reservoir of oil;
D. Chimney;
E. Cistern of the gasometer, represented as built of brick;
F. Gasometer;
G. Hollow pillar in which the counterpoise of the gasometer moves;
h, Pipe which carries the gas in such manner as to cause it to pass through the oil;
i, Pipe which admits oil into the retort.
k, *k*, *k*, Pipe which conveys the gas to the gasholder;
l, *l*, Inclined pipe to carry off the condensed vapors;
M. Cistern in which the condensed matter is collected:
n, Main distributing pipe;
o, Counterpoise.



The manufacture of oil gas is obviously much more simple both in theory and practice than from coal. It requires, however much more attention to the regulation o

the heat. If this be too low, less of the oil will be decomposed, and more of the condensible liquids generated. If it be too high, the gas will indeed be much increased in quantity, for at a high red heat it may be nearly doubled by the conversion of olefiant gas into hydrogen, but it will give less light than the less bulk of gas generated at the lower temperature. We shall examine this question further in speaking of the comparative value of oil and coal gas.

Oil gas may be distributed by pipes like coal gas. But it is more peculiarly fitted for being made portable. This is effected by forcing the gas, by means of a pump, into strong vessels of sheet iron or copper. The best form for these is a cylinder terminated by hemispheric ends; unless the size be small, when they may be spherical. In these the gas is compressed to the extent of thirty or even forty atmospheres; that is to say, the gas contained is thirty or forty times as much as the vessel would contain under ordinary pressure. In order to render them safe from accident, they are proved under a pressure of sixty atmospheres or nine hundred pounds to each square inch. The pump by which the compression is effected is represented. Pl.

(c) GAS FROM ROSIN.

Rosin may be decomposed and made to furnish a gas equal in quality to that from oil. The best method for this purpose is the invention of Professor Daniell of London. The Rosin is dissolved by heat in spirits of turpentine, and the solution treated in the same manner as oil. To obtain gas of the best quality, however, it seems to be necessary to attend even more particularly to the regulation of the heat than in the use of oil. At too low a heat, the vapor of the spirits of turpentine passes over, and will cause the gas to burn with smoke. At too high a heat, a larger quantity of elastic fluid will indeed be generated, but in spite of this increase it will give less light.—For a long time gas from rosin was used as portable gas, in London, and was found to answer the purpose as well as that prepared from oil. In experiments at which the writer assisted, made at the New-York gas works, rosin gas was found to give as bright a flame, and as much light from the burning of a given bulk, as oil gas. It does not appear however, that the gas usually furnished by that establishment is of as good quality as that which was the subject of experiment.

(d.) COMPARISON OF THE VALUE AND ILLUMINATING POWERS OF GASES FROM THE SEVERAL MATERIALS.

AUTHORITY.—CHRISTISON and TURNER. Edinburgh Philosophical Journal No. XXV.

The illuminating power of a gas will depend upon the proportion in which the several compounds of Hydrogen and Carbon, and uncombined Hydrogen are mixed in it. Of the gaseous compounds of those two elements olefiant gas has the greatest density, and the vapors of the two liquid compounds are even heavier than it. As the flame of these three compounds is more brilliant than that of carburetted hydrogen, and as uncombined hydrogen which gives but little light, has has no more than an ¼th of the density even of light carburetted hydrogen, it will be obvious that the denser the gas the higher its illuminating power. This power however, does not increase exactly as the density, but to all appearance in a higher ratio. The densities of gas from different substances and prepared in different ways, is given beneath, in terms of hydrogen as the unit.

Coal Gas from the London works used by Mr. Dewey in his experiments,	2.10
Coal Gas from Westminister used by Brande,	6.64
Coal Gas of Edinburgh and Glasgow— mean,	9.00
Oil Gas of Taylor and Martineau,	13.54
Do. best,	14.49
Oil Gas of the worst quality made in England,	9.90
Coal Gas of Perth,	10.50
Oil Gas made in France,	6.98
Oil Gas made from Whale oil in Edinburgh,	15.75
Gas from cannel coal within the the first hour of distillation,	9.75
After ten hours,	5.17

The last named gas, which has the least density of all, contains—

Olefiant Gas and vapor	0
Light Carburetted hydrogen,	20
Hydrogen,	60
Other Gases,	20
	100

That obtained during the first hour, and having the density of 9.75, contains

Olefiant Gas and vapors,	13
Light Carburetted hydrogen	82½
Hydrogen,	0
Other Gases	4
	100

The French oil gas of the density of 6.96 consists of—

Olefiant Gas and vapors,	6
Light Carburetted hydrogen,	28
Hydrogen,	45
Other Gases	21
	100

The Oil Gas of Taylor and Martineau whose density is 13.54 contains—

Olefiant Gas and vapor,	38
Light Carburetted hydrogen,	46.5
Hydrogen,	3
Other Gases,	12.5
	100

The oil gas whose density is as high as 15.75 is probably almost wholly composed of olefiant gas and the vapors of the liquid carburets. Its illuminating power is probably even greater than that of pure olefiant gas prepared from alcohol, and bears to that of gas from common coal of the density of 6.10, the ratio of 4:1. The coal gas of Taylor and Martineau has an illuminating power bearing to that of the average gas from cannel coal of the density of 9, the proportion of 2:1. But as the manufacture of oil gas is attended with more difficulty than that from coal, it does not appear that when good cannel coal can be procured, it will be safe to count upon a greater superiority on the part of oil gas than 3 to 2. This rule may at any rate be considered to apply almost with certainty to gas from rosin, whose manufacture is even more precarious than that of oil gas. If however the oil-gas is of good quality and the coal gas of the worst the relation is as 3 to 1.

In burning gas it will be observed that the flame is of a pale blue color near the orifice, then becomes white and brilliant, while towards the summit it again becomes pale. According to the rationale already explained this is readily accounted for. At the orifice, the burning of a part of the gas and vapor causes the deposite of carbon, which disseminated through the next part of the flame, gives it brilliancy; but as the carbon burns itself, it is exhausted before the summit is reached and the flame again loses its brightness. If however, the carbon be not wholly consumed it will make its appearance in the form of smoke, and we hence infer that the flame will reach its maximum of brilliancy, just before it begins to emit smoke It might however, be a question, whether the expenditure of gas will not equal or more than counterbalance the increase of light. This is a question which can only be settled by experiment, and we shall therefore, quote those of Christison and Turner.

In a flame from a single jet, fed by coal gas the following were the results:

Length of flame,	2 in.	3 in.	4 in.	5 in.	6 in.
Light	55 6	100	150.6	197.8	247.4
Expense of gas	60.5	101.4	126.3	143.7	182.2
Light from a given quantity of gas.	100	109.	131.	150.	150.

It will therefore appear, that by increasing the flame from two to four inches the light is increased from 55.6 to 197.8, or between three and four times; and that with the long flame one half more light will be given with an equal expense of gas than by the short flame.

With oil gas from a single jet the results were

Lenght of flame	1 in	2 in.	3in	4 in.	5 in.
Light	22	63.7	96.5	141	178
Expense of gas	33	78.5	90	118	153
Light from equal quantities of gas	100	122	159	181	174

ACCLIMATION OF PLANTS.

We publish below from Mr. Reynold's Voyage of the Potomac, an interesting article on the subject of Acclimation of Plants, and on the introduction into the U. States of the fruits and vegetables of China. The principles of vegetable physiology which are developed in the extract, were first suggested by a gentleman in Florida, and if we are not mistaken were published in one of the public journals of that Territory. To Mr. Reynolds we are indebted for putting them before the public in a form calculated to arouse the attention of our enterprising agriculturists, and we hope they will not escape the observation of the Agricultural Committee of Congress.

We have been informed that the sub-

stance of this extract, somewhat in the shape of a memorial, has been laid before the Heads of some of the Departments of the Government, and have met with their approbation.

Although the views taken in the extract are novel, yet they are founded on facts and principles not to be controverted. The expense attendant on fitting out an expedition to attain the object contemplated, is a trifle not worthy of consideration when compared with the prospective advantages. The agriculturists of the country may, we think, with confidence, ask this small boon from the General Government. As yet the Government has done nothing for agricultural interests. It may, *we think*, now do a great deal at a very small expense.

"A proper estimation, in this country, has never been placed upon the benefits which might result to agriculture and particularly to horticulture, from an expedition to the coast of China. That country has a climate similar to our own, arising from its similar position on the eastern edge of a great continent. Both are dry, and subject to greater vicissitudes of heat and cold than countries in the interior, or on the other side of the great continent. This being the case, the vegetable productions suitable to the one, cannot but thrive well in the other.

China has been a long time civilized, and the whole extent of its coast been for ages under a government which has paid more attention to agriculture than any other government that has ever existed. Under such circumstances, it is impossible to be otherwise, but that the vegetables and fruits of the various climates have been acclimated to a degree much beyond what they have with us, or in Europe, from whence we derive our fruits and vegetables.

The territories of China, embracing both sides of the tropic, we have every reason to believe that the production of the south have been extended as far as possible to the north, and those of the north to the south.

By getting, therefore, fruits and vegetables from a conntry thus situated, we get the advantage of a thousand or more years of acclimation.

For instance, we get our apples and pears from England and France. The apple we have not yet acclimated as far south as Georgia. There are, we believe, only one or two varieties, which in the upper part of that State, prove fruitful in some years.—Their flavor is very indifferent. So with the pear. Coming from the latitude of from forty-two to fifty, it is unproductive south of Baltimore; and so with other fruits.

Who can doubt but that, in a country in which the extention and prosperity of agriculture have been the great object of government, their fruits and other vegetables have, in the course of fifteen hundred years, been extending gradually to the south, so as to become used to a climate which it will take us nearly the same period to reach with the varieties of fruits which we now have. It is the same with the fruits and vegetable productions of the south. The tropical fruits and vegetables must have been brought as far north as they can be profitably cultivated. From fifteen hundred to two thousand years have been passed in this process of acclimation.

Why should we undergo this long process, when a few thousand dollars may introduce them among us?

It is well known, that among the other plants, the sugarcane may be gradually introduced into a climate which was at one time incongenial to it. The Otaheite has been introduced into Louisiana. What a gain it would be to our country if a variety could be procured which would be raised one degree farther north than the Otaheite! The advantages from this single plant alone would a thousand times compensate for all the expenses of such an experiment.—For the introduction into this country of the various fruits and vegetables which such a country as China must produce, might be attended with advantages almost incalculable.

We have already received from China one animal, the benefits of which to our country surpass a thousand times the expenses which might accrue in setting on foot the proper inquiry in relation to this matter. The Chinese hog is the animal to which we allude. A long series of years devoted to the selection of animals having a propensity to fatten, could alone have produced the breed, which has added so much to the wealth of our farmers, and to the pleasure of our epicures who admire a nice ham. What would our gardeners think of the immense piles of headed lettuce, described by travellers in China as heaped up at the gates of the cities, preparatory to entering and being distributed among the morning markets? We have nothing of the kind in the United States or Europe. We cannot have, unless by hundreds of years of preserving industry and care.

These things are more particularly of importance, because they are those in which the great mass of the community are directly and principally interested. They add to the comfort of the poorest as much as they do to the richest. All are benefited, and none could complain of any expenditure which all acknowledge is for the benefit of all classes, and all sections. If there be any section that may be more benefited than another, it is from latitude 32 deg. south.

The introduction of one single vegetable, the turnip, into England, changed the whole face of a large district of country, and rendered it, from being almost barren, one of the most fertile in the kingdom.

As to the commercial advantages, independent of other articles of commerce, which might be brought into view by means of such inquiries, we have no doubt that the introduction alone of the iron of Formoso into our country, would be found in ready demand. That iron is of so superior a quality, that, for some particular purposes, it would be invaluable. Such is the temper that can be given to it, it is stated, that swords made of it will sever with ease those made of ordinary steel. What a desideratum to all the mechanic arts would be a sufficient quantity of it to make our finest edged tools, and most delicately constructed instruments.

From the Farmers' Register.

ON THE USE OF THE OSAGE ORANGE (MACLURA AURANTIACA) AS FOOD FOR SILK WORMS.

Some months ago the Farmers' Register contained a translation of an interesting article by M. Bonafous, giving the result of an experiment on feeding the silk worm on the leaves of the Maclura. Although the authority of that gentleman may be regarded as decisive on any matter connected with the culture of silk, yet as many substitutes for the mulberry have been successively used and discarded, it was reasonable to suppose the Maclura might share the same fate.—On trial however, I found it to answer all the purposes for which M. Bonafous recommended it; and as the silk business is becoming an important branch of industry of the United States, I am induced to detail, in corroboration thereof, the result of my own experiment.

In the month of May, I had a few thousand eggs to hatch; and during the three first ages the worms were fed exclusively on the leaves of the Maclura. At the commencement of the fourth age, they were divided into several parcels, with a view of giving to each a separate kind of food.—About one third were continued on the same—the native mulberry was given to an equal number—a portion of the balance was fed on the Maclura and Chinese mulberry indiscriminately—and the remainder on the Chinese mulberry alone. During the process, I could not perceive that the worms manifested any partiality between the leaves of the Maclura and those of the Chinese mulberry: if they evinced any, it was certainly not in favor of the latter. But they greatly preferred *either* to the leaves of the red mulberry, some of which I would occasionally lay on the shelves, where they would suffer them to remain until compelled by hunger to eat them. On the contrary, when these which had the red mulberry leaves assigned to them, were furnished with a few of the Maclura, they would collect around the latter, and devour them with avidity, before they would begin to feed on their accustomed diet.

The relative value however of the Maclura and Chinese mulberry for the production of silk, was only to be fully determined after the formation of the cocoons. It may be recollected by those who read the article of M. Bonafous that he regarded the Maclura as chiefly valuable for feeding the worms during their early age; that subsequently they should be supplied with the mulberry, their natural food: and that though the former would produce silk of a fair quality, yet it would be inferior and in diminished quality compared with the product of the mulberry. I find this to be true as it regards the Maclura and Chinese mulberry, so far at least as it respect the size of the cocoon: but the Maclura is at least of equal value to the red or native mulberry. The worms fed on the Chinese mulberry, spun cocoons weighing from thirty to forty-five grains—those raised on the Maclura and Chinese mulberry combined, made their balls somewhat lighter on the average—while the weight of those obtained from the Maclura and red mulberry respectively, was about equal, and still less than either of the preceding. The quality of the thread for the manufacturing purposes, I am unable to pronounce upon, not having yet submitted specimens to a competent judge. The cocoons were nearly all of a pale straw color.

If the value of the Maclura consisted only in furnishing food for the silk worm, it

might from its extreme hardiness and consequent exemption from late spring frosts, be deemed worthy of planting: but when to this, other important uses to which it may be applied are superadded, it appears to present irresistible claims to our favor. I may, therefore, be excused for dwelling more at large on its merits, which have as yet scarcely begun to be appreciated, or even known.

In many parts of the United States the scarcity of timber has for many years been sensibly felt. Still our forests continue to disappear; and to mitigate the evils of this alarming destruction, efforts have frequently been made to substitute live for dead fences. It is believed, however, that hedges have not to any considerable extent answered the purposes of an enclosure. After all the trouble and expence bestowed upon them, they have in most instances finally dwindled away, and been rooted out.—Hence it may be inferred that the plants used in their construction, have been too feeble in their constitution and therefore incapable of attaining the necessary size and developement. A plant that would unite these requisites would be a desideratum.—Now it has been confidently asserted that the Maclura will make a most substantial and impervious hedge—a fact which cannot well be doubted by any person who will take the trouble to examine its manner of growth. The branches are thickly set, and the lateral ones almost uniformly take a horizontal direction: they are moreover armed with a number of sharp and very rigid spines, which do not disappear, as has been stated, after one or two years, but permanently remain. The plants grow with such vigor, that it would only require a few years, under careful treatment, to rear an excellent hedge from the seed. To those who are fond of the ornamental, it may also be recommended for the lustre of its foliage, and the magnificence of its fruit.

Hitherto, the means of propagating the Maclura have been rather limited. It grows but indifferently from cuttings, and not with certainty from slips of the root. The only mode which can be depended on for extensive increase, is by the seed. These have been seldom perfected on this side of the Mississippi, owing partly to the small number of trees which gentlemen have introduced into their grounds, and also to inattention to the fact that they are dicecious. With a knowledge of this characteristic, there is no difficulty in having them to bear abundantly. There is one growing in my garden, now seven or eight years old, which has matured its fruit for a year or two past, and which would have borne considerably earlier, had not the staminate plant perished which was ordered with it. The one subsequently obtained was feeble in its growth, and slow in flowering. Last year the number of seeds which ripened, amounted to many thousands. These readily vegetated in the spring, and the seedlings are now growing in nursery rows as finely as could be desired.

I regret that I have not been able to compress my remarks into a smaller space; but before concluding, I will take the liberty to suggest to some of our enterprising seedsmen the propriety of obtaining a parcel of the seed of the Maclura from its native forests. They may be gathered in any desirable quantity on the Red river and in the contiguous parts of Arkansas. It is the practice now to compass sea and land to discover a new vegetable for our tables, or a flower for the parterre; and while the seeds of these productions meet with a ready sale, in consequence of the increased taste for horticultural pursuits, it is not to be doubted that a considerable demand will also be found for those of a plant which will equally contribute to the ornamental and the useful.

T. S. P.

Goochland, 7th Month, 1836.

From the Gardner's Magazine.

ON THE GERMINATION OF THE NELUMBIUM SPECIOSUM.—BY J. L. R.

Having received from a friend a fresh nut of this splendid oriental plant, I was induced to watch the development of its germination. After remaining in a glass of pure water on my mantle for about three weeks, I perceived a wide dehiscence near its summit, and the first emission of young roots. A compost of clay, vegetable mould and sand, in nearly equal parts, was then provided, and the nut partially planted in it. The pot was then plunged into another, glazed and water-tight, and covered with river water to the depth of three or four inches. In a few days the first leaf appeared, curiously convoluted, by its ridges being rolled towards its disk. Not long after its expansion another made its appearance, and in the course of a month five have been developed in considerable vigor. The plant then seemed to make a pause for a few days, when I perceived a strong and thick rhizoma pushing downwards from the axis, and throwing out a profusion of roots about half the distance of the length; till finally a new leaf has been evolved from the extremity of this root stake.

I have noticed, in the first volume of your Magazine (p. 350), that a fine plant of this species was thriving under the culture of the Hon. John Lowell. What has been the fate of the plant? Has Mr. Lowell succeeded in flowering it?

The germination of the nelumbium is interesting, on account of the seeming absence of cotyledons, and thus possessing the anomalous character of an exogenous acotyledonous plant. Much uncertainty exists respecting its true physiological development. On the outside of the base of the albumen is the embryo, enclosed in a membranous bag or sack. This, by Richard, was considered its cotyledon, and he accordingly placed the genus among the monocotyledons and Endogeneæ. De Candolle and Mirbel considered it as exogenous and dicotyledonous, regarding the sack as a peculiar membrane, and possessing, also, a two-lobed embryo. From the structure of the stem, the character of its leaves, and also of its flowers and fruits, little doubt can remain that it more properly should be arranged according to the opinion of the two latter botanists.

The sacred Lotus of the Nile is the present species. According to Delile this celebrated locality of antiquity cannot boast of its present possession. In China, where it is extensively cultivated, its rhizoma and nuts afford a considerable article of food. These, served up with apricots, walnuts and ice, were offered at breakfast to the British ambassador and his suite. Some of the Japanese and Chinese deities are represented as sitting on its broad and peltate leaves, thus distinguishing it as a sacred plant.

My plant *Nelumbium* speciosum var. album, is freely offerred to any one who desires to grow this rare and splendid flower in a conservatory or proper aquarium.

August, 1836. J. L. R.

From the Am. Gardner's Magazine.

ON THE CULTIVATION OF SEVERAL OF THE MOST BEAUTIFUL SPECIES AND VARIETIES OF CACTUS AND CEREUS. IN A SERIES OF PAPERS. BY J. W. RUSSELL.

Cereus flagelliformis (creeping cereus), is an old inhabitant of the *stove* and greenhouse. The stems of the plant, when in a healthy luxuriant state, resemble a whip-lash, whence its trivial name, flagelliformis. This interesting species, when interspersed with some of its co-species, that are of a more robust growth, makes an elegant contrast, showing, to the most careless observer, the difference in the habits of growth in the same family of plants. The flowers expand their blossoms in the months of May and June, and are of a dark rose color, arranged indiscriminately along the stems of the plants,—although sometimes a number of them are closely set together, not in a *cluster*, but in one straight line, one or two inches apart. It is a native of Peru, and has been cultivated more than one hundred years.

Epiphyllum speciosum *Haworth* (Cactus speciosus *B. R.*) is also an old favorite: the stems of the plant are thin and flat, from one half an inch to two inches in width, and of a very irregular habit of growth; but by judicious pruning it can be made an elegant plant. Stands of a circular form, or flat, in the shape of a ladder, should be used for training this plant to; the shape of the stand, however, may be left altogether to the taste of the cultivator, as something of the kind is indispensably necessary, to train up the shoots, that they may be kept in regular order. The superfluous growths must be taken off with a *sharp* knife, remembering to *reserve*, if possible, the strongest growths. The admirable appearance of this plant when in full bloom attracts the attention of every person; its beautiful rose or blush colored flowers expand in June and July, and the plant presents a splendid show for a fortnight or three weeks. The flowers are produced from the sides of the stems, and the dark colored vein, which is generally observable, that leads from the centre of the stem to the bud, is almost a sure sign of a flower.—This species is a native of South America, and has been cultivated about twenty-five years.

Epiphyllum truncatum *Haworth* (Cactus truncatus *Lk.*) is a fine sort: the stems are flat, and about half an inch in width: the extremity of the shoot is scolloped out as though bitten off by an animal: the flowers are of a darker shade than those of speciosum, and more elongated—the habit of the plant more close and compact: this has been cultivated ten or twelve years.

Cereus Ackermani is a new variety, and rivals the far-famed Cereus speciosissimus in the beauty of its flowers; however, it is deficient of the fine purple tinge which is so prominent a feature on the inner petals of the latter plant. The flowers expand in a similar manner, and continue three or four days in great perfection, and they are also equally large; by some cultivators it is esteemed second to none of its co-species that are yet known. The habit of the plant resembles E. speciosum; the stems are more

fleshy and broader, and of a lighter green color; sometimes the young growths are quadrangular or four-sided, but they ultimately grow out to a thin expansion, broad and flat. The time of flowering is in May and June: it has been cultivated but five or six years.

Cereus Jenkensonia is also a new variety, and resembles E. speciosum in its habit of growth: the flowers are of the same shape, only considerably larger: the color an elegant crimson: time of flowering June and July, and has been cultivated about four years.

Cereus Vandesia is quite new and scarce: this also resembles E. speciosum in its habit of growth; the flowers are of the same shape, but as large as those of Jenkensonia, and a shade darker in color. It is a free grower, and well adapted for training to a trellis, or a round stand. Time of flowering, July and August.

Opuntia vulgaris *Haworth* Cactus *O*puntia *L.* (Indian fig), has been cultivated more than two hundred years. It is too well known to nced any description; with good treatment it will grow luxuriantly.—Its large fleshy broad stems are admirably well adapted for grafting all the kinds I have now spoken of upon, which can be done in the followieg very simple manner, viz:—first, take off the cutting from the plant that you wish to insert on the Indian fig—then make an incision in the stem with a sparp knife, as near the same shape and size as possible as that of the cutting; observe to take the piece out so as to allow the scion to be inserted about an inch deep. If this is neatly done there is no fear of success. Let any person imagine the splendid effect a large plant will have four or five feet high, spreading in every direction, with some of the sorts here mentioned grafted on it, growing most luxuriantly and flowering profusely; this I have seen—and I can assure every reader of this that it was a beautiful object.

I hope ere long to see this very interesting family of plants more generally cultivated, and the compost recommended in my former papers tried, which I think will be all that is necessary, to ensure its permanent use, in preference to the sandy soil, destitute of any richness, which is generally recommended.

Yours,

J. W. Russell.

Mount Auburn, August 8, 1836.

PAPER READ BEFORE THE MECHANICS' INSTITUTE, JUNE 2D, 1836, ON THE ORDER OF THE CREATION. BY OLIVER SMITH, MEMBER OF THE INSTITUTE.

Let us go back in the history of the earth as far as we can; and how far will this be? Can we pursue this retrogade course any further than the sacred historian has done, when he says, that, "In the beginning God created the Heavens and the earth"? To this question we shall endeavor to give an answer; and that answer will be in the negative; though in coming to this conclusion we shall adopt a course that may be thought perhaps, to be a little circuitous. And first, we would make the remark, that it is no where directly asserted in the sacred volume, that there is a God, or Great First Cause of all other things; but that is always assumed there, as indisputably granted. To say that the material universe around us arose and continues by chance, would be what the sacred penmen seem not to have expected to hear from any rational and sober man; and they appear to have made no provisions to meet one that would do so. In fact we may safely say, I think, that no one in the full exercise of reason, ever seriously believed this; and but few, comparatively speaking, have ever been reckless enough to assert it. And should it be contended that, although there may be a God, a Great First Cause, who has moulded matter into the present order of things, still matter itself is eternal, we might reply that if matter is eternal or coeval with the Deity, it must either constitute a part of this being or be independent of him. And if it exists independently of him, how does he control it as he plases, as we all profess to believe that he does? And again it may be asked how does he know exactly what it is, and how to use it, unless he made it? In short, we must believe that there is a God, and that he consists not of matter, nor partly of matter, but of pure intelligence and power, and rectitude, or something which we call spirit, but of which we can form no other idea than that of an assemblage of attributes where the ones just mentioned are prominent; and that he not only gave to the material universe its present structure, and sustains it as it is; but actually made or originated the materials of which he formed it. And if there are difficulties in this supposition, there are still greater ones to embarrass any other we can make upon the subject. We are none of us prepared to say there is no God; nor that matter exists independently of God; nor that it constitutes a part of his being.—What then can we do in this case but to adopt the simple language we have already quoted above, that, "In the beginning Gop created the Heavens and the earth"?

We can make suppositions with regard to the steps which the Creator adopted to accomplish this work, but they will be mere suppositions; and yet they may aid us to perceive how little we know with any degree of certainty, upon the subject before us. Let us then suppose that, among all the material bodies in the whole wide regions of space, the Sun was the first that was brought into being, and endowed with the property of attraction, and located, no matter where. As there was no body to attract it from its place, it must have remained there as long as the power that left it permitted it to do so. Next we suppose, that some one of the planets was formed, and being so formed, and endowed with the property of attracting other bodies, and of being attracted by them, it must have been immediately set to revolving around the sun; for otherwise, it would rush directly to it, and become united with it. Thus we can suppose that the whole solar system was brought into being and put in motion.

Now let us suppose that Sirius, the brightest star in the heavens, and for that reason conjectured to be the nearest, was located in the same relative position which it now occupies with regard to the sun; and made to revolve around the common center of gravity, betwixt its self and the solar system; while this system was made to revolve around the same center. In this way the bodies in question might be made to preserve the same distance from each other. And more too, a full system of bodies might be made to revolve about Sirius constituting a Sirian system.

Next we can suppose that Arcturus, apparently the largest, while Sirius is the brightest star in the heavens, was formed; and a system of bodies made to revolve around it; and this Arcturian system made to revolve around the common center of gravity betwixt itself and the solar and Sirius of which we have spoken; while these latter were revolving around the same center; and all this before the bodies in question had time to rush together; and thus, all three of these systems might be made to preserve the same distance each from the others; and so on indefinitely. From this it appears that the heavenly bodies may be kept in their *relative* positions, although creation is not interminable; but in order to preserve them in their *absolute* positions, it is necessary that they should be placed at proper distances throughout immensity; for the exterior ones, and such of course, their will be, unless they are infinitely extended, will tend toward the interior ones; and in order to prevent them from rushing together, they must be made to revolve about each other. But as their natural attractions will be inversely as their distances apart, the motion in question must be very small in the systems around us, as the space between them is inconceivably great. Such a motion is suspected, but not yet positively proved, in the solar system; and till it is proved, we must suppose that creation is boundless as infinite space; for otherwise we cannot account for the equlibrity, which is doubtless no less real than apparent in the heavenly bodies. It is true that some of the stars have a motion, but this does not appear to be the one to which we have now reference; and if no such motion exists in the bodies above us, then no part of creation could have existed before the other; but the whole must have been thrown into being throughout immensity, at the same moment of time. So that it might well be said that "God spoke and it was done; he commanded, and it stood fast." We can suppose, and perhaps the supposition may aid our weak conceptions, that matter in its incipient state, was not endowed with the property of attraction. And in fact, from the representations that are given us of what the important telescopes of the present day are bringing to view in the regions above us. We have perhaps, some ground to supect there are masses of matter around us that are not formed into regular bodies, nor subjected to the laws of gravitation.—The Great Dr. Good, in that immortal work, his Book of Nature, more than intimates, as I understand him, that in his opinion, this is very possible. However, it must be admitted that all this is little better than mere conjecture.

As to the earth, or any one of the planets, as soon as it became endowed with the property of attraction, whether at the moment of its formation or subsequently, it must have been set in motion around some centre of attraction; and this motion, not affecting the senses of those who may happen to be upon the body thus moved, may be called its stability; and this is obviously all the sacred writers mean when they speak of the foundations of the earth. To common observation, the earth appears indeed to stand "fast."

We cannot go back in the history of the earth, then, beyond the period when it began to revolve around the sun, as it now does. It is true we can make suppositions—we can suppose it to have been made up in part or in the whole from the ruins of some other body or bodies; but this we are not likely to prove very soon; and even if we

could do so, the result might not carry us very far into the history of those ruins.

About fifty bodies are found in the earth that are called simple ones; and they are thus denominated, not so much because they are believed to be absolutely so, as because chemists have not succeeded in their endeavors to decompose them. In fact they are all known to contain more or less of light, caloric, and electricity, and some of them magnetism; and if these latter are material substances, or modifications of any material substances, as they are supposed to be, then the bodies in question cannot be simple ones. From these, however, whether simple or compound, it is that all others with which we are acquainted are composed.

Now if we go back and suppose a time when these simple bodies were all put together, we shall gain but little in any respect; for they must, as a consequence of their mutual attractions, have assumed the same globular form that now characterises the earth and the other planets; and they must have commenced immediately to tend toward the sun, either by revolving around it, or by going directly to it; according as they received the proper impulse, or none at all; and furthermore, a chemical action must have taken place immediately among them, producing compound bodies similar to what we now find in the earth.

The first we can reasonably suppose of the earth then is, when it began to revolve about the sun, consisting as it now does of various compound and heterogenous materials. But we can reasonably suppose it contained caloric enough to render it fluid; so that it may well be said to have been "without the proper form" for animal or vegetable life; and to be, consequently, totally "void" of both; while "darkness," or confusion and disorder, so far as either of these kinds of life are concerned, "was upon the face of the deep," or upon the whole map of melted matter of which the earth consisted.

Now let us suppose what must have been true, that this caloric began to radiate to the vacant regions around us, till the surface of the earth became so far cooled, that a thin crust was formed around it. Meantime, the internal caloric was raging and caused a commotion that broke up this crust more or less in different places. Again the surface continues to cool, and another crust is formed including the ruins of the first, and consequently twice as thick as that was. This again is broken up in the same way, and a third one is formed including the fragments of both the others, and consequently three times as thick as the first one; and so on down to the present time. And something of this kind we actually see going on at this very day. Volcanoes and earthquakes, the first being obviously, and the other very probably, the effects of internal fires, are breaking up the crust of the earth more or less in different places. A large tract of country in Sweden is now actually rising; and other regions in Italy have risen and fallen, and risen again within a few hundred years past; and much the same may be said of many places in South America. In this way we may account for the irregularities in the surface of the earth.

We can make other suppositions, to be sure. We can suppose that the earth was thrown from the sun and the moon from the earth; and we can further suppose that other bodies have been ejected from the earth, and fallen back upon it again; and this will aid us to an explanation of the great confusion which appears occasionally among the rocks and straturns that present themselves in the crust of the earth; and it is possible that the whole or a part of this did actually occur. But the simple formation and breaking up of these successive crusts, in the manner above suggested, will go far to explain all this confusion.

Now let us suppose that the surface of the earth is cooled down to about 85 or something less of Centigrade, or, what is the same thing, to about 150 or 100 of Fahrenheit; so that the water which may have been previously formed by the union of the oxygen and hydrogen that were found among the materials of the earth; and which, if thus formed, must have existed around the earth in a state of steam, is settled down upon the irregular surface, and begins to form oceans, seas, lakes and rivers there, according to what the historian has told us. The oxygen and nitrogen, which happen to be at liberty, arise, in consequence of their specific levity, and form an atmosphere around the earth; and the water that condenses upon it, is separated from the vapors that still remain above it; and as this water runs into the cavities as above suggested, the dry land "is made to appear."

Now we know that animalcules will make their appearance in warm water that is allowed to remain stagnant for some time.—They are called infusiora, because they are more apt to appear in such water when it contains an infusion of animal or vegetable matter; and perhaps they are not found in any water at this day, except such matter is present. As these animalcules, though being ranked as they are with animals, they are presumed to be organised, yet exhibit no proper organization, but simply spontaneous motion, we shall call them chaotics, in contradistinction to the higher grades of animals, which, exhibiting, as they do, more or less of organisation, we shall call the organics. And of these chaotics we find two groups; the first of which, being homogeuous, we call the homogens; while the second, having appendages about them, which however are not arranged in any order, call the appendiculates.

We have now spoken of the lowest of the animal kingdom, of nature's first effort from mere dead matter to animalisation; and similar remarks may be made respecting her first step toward vegetation. This step appears in the Fungals Algas and Lichens, some of which are but one short remove, to appearance from mere inert matter; while in common with animals, some of them contain nitrogen; and some even exhibit a contractile motion. They have no distinct axis of growth, nor any distinct circulation of fluids, nor do they bear either leaves, that may be properly so called, or flowers; nor do they produce their seeds in that obvious manner in which the higher grades of plants do; and hence they are called Cryptogrames, a term that implies having a concealed mode of furetification. These were undoubtedly the first plants, and the chaotics the first animals. that appeared upon the earth.

We now rise to a higher grade of animals, which we call the Organies, or those that are obviously organised; and the lowest groupe of these, and the first we shall speak of now, are the Zoophites, or the animals that resemble plants. They unite together and form compound masses, and partake of a common life, so that what one of them eats goes to nourish all the rest. They have no head, though some of them have a buccal opening, and this is sometimes surrounded by tentacles. And let us bear in mind we have not yet ascended to the animated animals, or to those whose parts are arranged along a common axis, and much less to the cephalic or headed ones; but all these lower grades are headless; and their parts radiate more or less from a common centre. The same opening answers for the mouth and the arms; and they exhibit nothing like a circulating system, and but little of a nervous one; and this nervous system, when discoverable at all, consists in these lower grades only of medullary matter in different parts of the body. The animals in question subsist undoubtedly upon the chaotics, which they probably seize by means of their numerous tentacles. We divide them into two groups: the Coralifers, or coral bearers or producers, and the Zoanthids, or the animals that resemble flowers; and these we shall call Clessis. The Coralifers catch the lime and other matters that are found in the ocean, and with these they construct their habitations, some of which are mossy, as the sponge—some woody, as a few of the Tubularies—and some horny, as several of the Gorgons; but the most of them are calcareous and stoney, and consist of the coral reefs and submarine mountains that are found in the seas of warm climates. Some of these animals, and especially those that inhabit the sponge, are too minute to be seen. And here I would observe, in passing, that I think this to be the proper class for the Encimates, or lilly-snaped animals, which have been differently arranged by different Zoologists.

The Zoanthids we intend shall include those Zoophites only, which do not construct any habitation at all, being entirely naked. Some of them float in the ocean, while the rest affix themselves to some other body; but these have the power of removing at pleasure. A part of them are fleshy, and the rest gelatinous; and hence we can make two groups or orders of them; and their tentacles, whether expanded or closed, resemble flowers in the same state, and hence their name. The most prominent among them are the Actinias, or sea anemones. These added to the Chaotics will make three classes.

From the Zoophites we rise to the Zoaides, a term we adopt in contradistinction to Zoophite, and which implies proper animals; and the first group we come to here, are the Medusas which we shall call a class. Their form is discate, and their substance gelatinous, and they float in the ocean and shine in the night; and have tenacles which extend down into the water from the under side of their disc.

(To be Dontinued.)

It has been discovered that some of the Indian timber is singularly durable. The wood called the *jarrool* has the property of resisting the marine worms which commonly attack ships where they are not defended by copper. On a recent occasion they were found to have fastened on every description of wood forming the bottom of an unsheathed vessel save the jarrool, not even sparing the teak. The day is consequently not distant when jarrool will make a more important article of commerce than it hitherto has been.—(Observer.)

CONTENTS:

Editorial Notices.—Communication.—Fragments of my Memorandum Book 289
Some Remarks on the Tree Pæony (Pæonia Moutan.) . 291
On the Cultivation and Propagation of the Pink . . 292
Van Mons' Method of Raising Fruit Trees from the Seed . 294
The Silk Business 296
On Curing Tobacco.—Improvement of Worn Land . . 297
Remarks on the (supposed) Gypsum discovered in New-York 298
Not Conquered Yet.—Turkish Preparation of Tomato . 299
Different Effects, compared of the Green Sand, Calcareous Marl, and the Mixture of both 300
Phenomena of River 301
Ox Reform.—Printing for the Blind, etc. 302
Chinese Manufactures.—Improvements in Paris, etc. . 303
Beport from the Hon. Henry L. Ellsworth to the Secretary of State, and transmitted to the Select Committee on the Patent Laws 304
Mineral Manure 307
Application of Chemistry to the Useful Arts. By Professor Renwick 309
Acclimation of Plants 316
On the use of the Osage Orange 317
On the Germination of the Nelumbium Speciosum.—On the Cultivation of Cactus and Cereus 318
Paper read before the Mechanics' Institute . . 319

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